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Marimuthu et al.

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(54) **CUSTOMIZATION MANAGER**

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(73) Assignee: **Oracle International Corporation**, Redwood Shores, CA (US)

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(21) Appl. No.: **14/266,460**

(22) Filed: **Apr. 30, 2014**

(65) **Prior Publication Data**

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(51) **Int. Cl.**
G06F 9/44 (2006.01)

(52) **U.S. Cl.**
CPC ***G06F 8/71*** (2013.01)

(58) **Field of Classification Search**
None
See application file for complete search history.

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(Continued)

Primary Examiner — Xi D Chen
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(57) **ABSTRACT**

A customization includes a name of a module of source code in an existing generic version of application software, a specific position within the module, and a name of a file which contains additional software. An existing customized version of the application software is then prepared, to execute the additional software in executing the existing generic version at the existing specific position. When a new generic version of the application software is received, the existing customization is displayed if applicable to a module in the new generic version, followed optionally by receipt of an update to the existing specific position. On indication of user approval, a new customized version of the application software is prepared, to execute the additional software in executing the module in the new generic version, at the existing specific position or at an updated specific position, which depends on the optional receipt of the update.

18 Claims, 15 Drawing Sheets

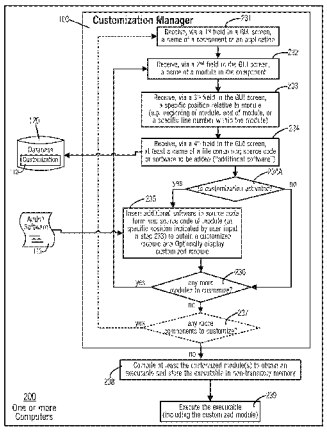

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FIG. 1A

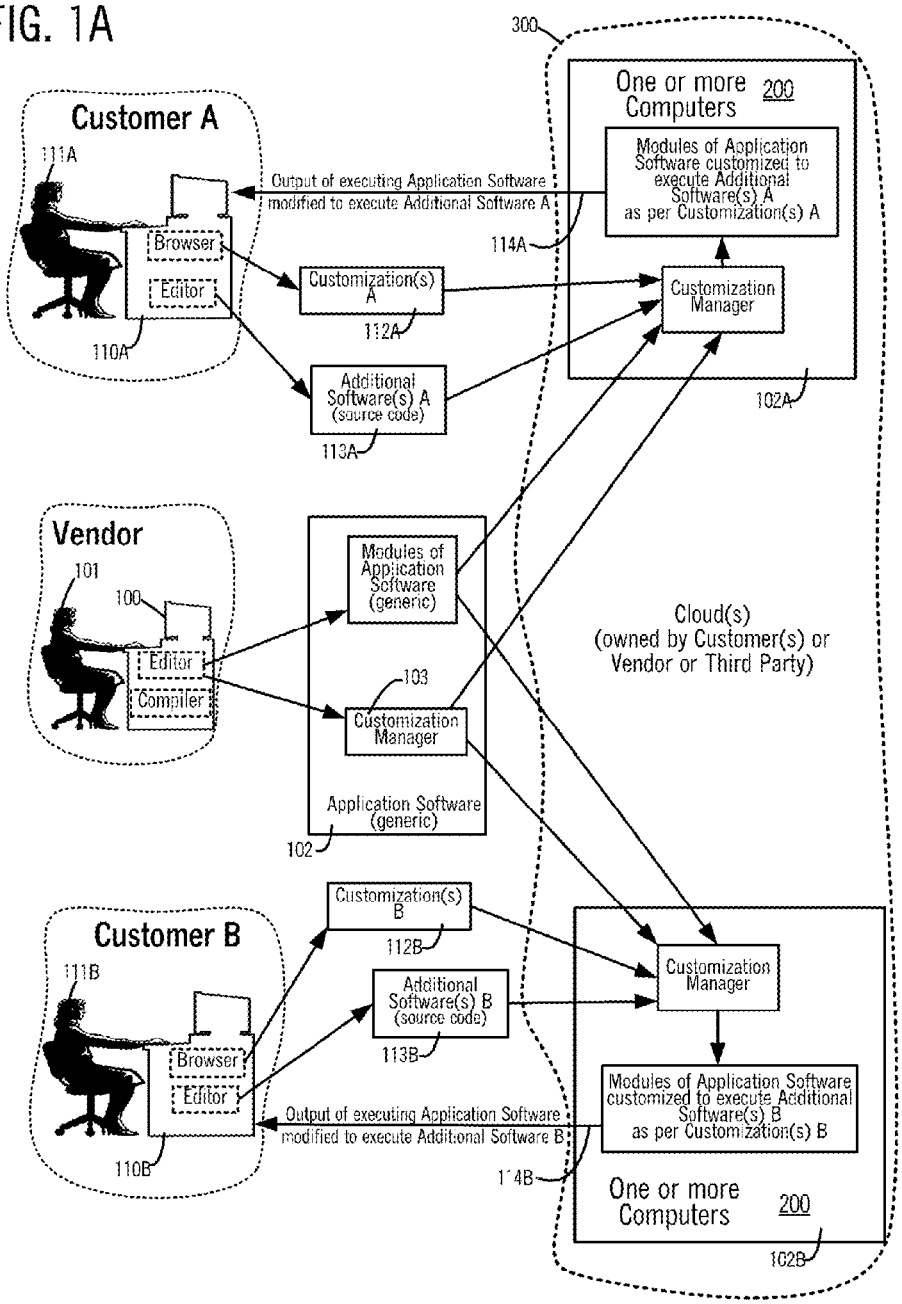

300
One or more Computers 200
Modules of Application Software customized to execute Additional Software(s) A as per Customization(s) A
114A
Customization Manager
102A
Customer A
111A
Browser
Editor
110A
Output of executing Application Software modified to execute Additional Software A
Customization(s) A
112A
Additional Software(s) A (source code)
113A
Vendor
101
100
Editor
Compiler
Modules of Application Software (generic)
103
Customization Manager
Application Software (generic)
102
Cloud(s) (owned by Customer(s) or Vendor or Third Party)
Customization(s) B
112B
Customer B
111B
Browser
Editor
110B
Additional Software(s) B (source code)
113B
Customization Manager
Modules of Application Software customized to execute Additional Software(s) B as per Customization(s) B
Output of executing Application Software modified to execute Additional Software B
114B
One or more Computers 200
102B

FIG. 1B

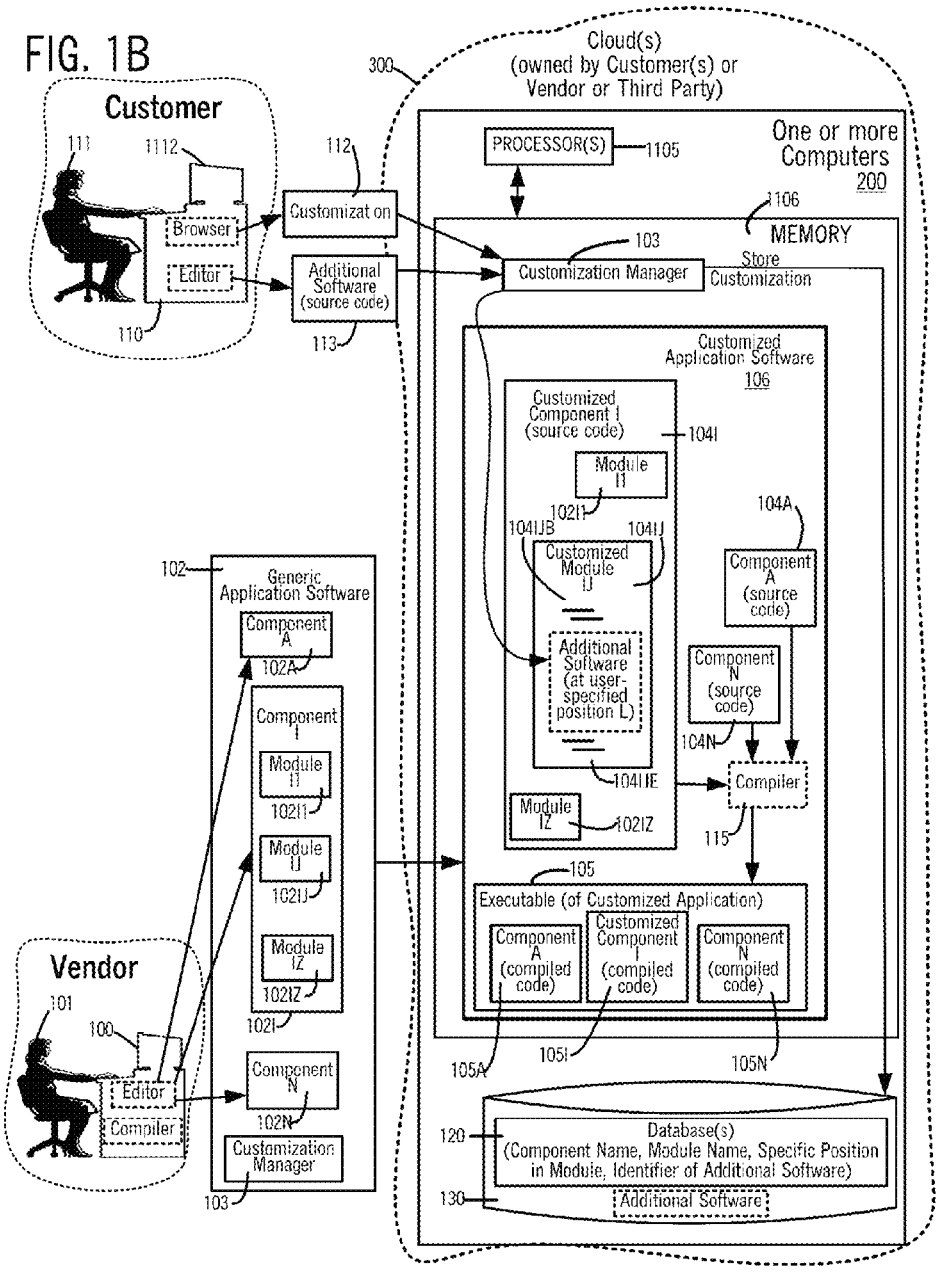
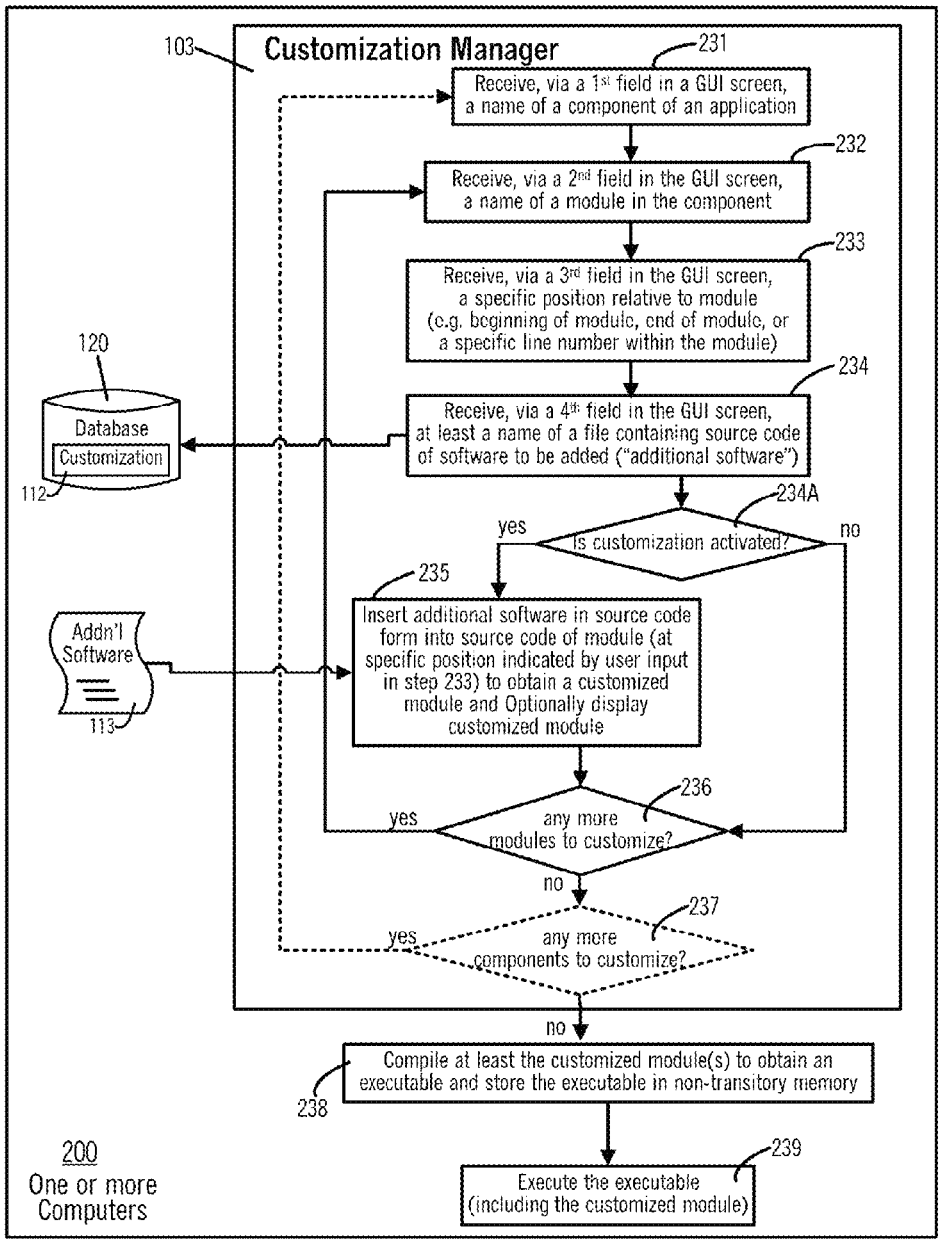

Cloud(s)
(owned by Customer(s) or
Vendor or Third Party)
300
Customer
111
1112
Browser
Editor
110
112
Customizat on
Additional
Software
(source code)
113
PROCESSOR(S)
1105
One or more
Computers
200
1106
MEMORY
103
Customization Manager
Store
Customization
Customized
Application Software
106
Customized
Component I
(source code)
104I
Module
II
102II
104IJB
104IJ
Customized
Module
IJ
Additional
Software
(at user-
specified
position L)
104IIE
Module
IZ
102IZ
104A
Component
A
(source
code)
Component
N
(source
code)
104N
Compiler
115
105
Executable (of Customized Application)
Component
A
(compiled
code)
Customized
Component
I
(compiled
code)
Component
N
(compiled
code)
105A
105I
105N
120
Database(s)
(Component Name, Module Name, Specific Position
in Module, Identifier of Additional Software)
130
Additional Software
102
Generic
Application Software
Component
A
102A
Component
I
Module
II
102II
Module
IJ
102IJ
Module
IZ
102IZ
102I
Component
N
102N
Customization
Manager
103
Vendor
101
100
Editor
Compiler

FIG. 2


103
Customization Manager
231
Receive, via a 1st field in a GUI screen, a name of a component of an application
232
Receive, via a 2nd field in the GUI screen, a name of a module in the component
233
Receive, via a 3rd field in the GUI screen, a specific position relative to module (e.g. beginning of module, end of module, or a specific line number within the module)
234
Receive, via a 4th field in the GUI screen, at least a name of a file containing source code of software to be added ("additional software")
234A
Is customization activated?
yes
no
235
Insert additional software in source code form into source code of module (at specific position indicated by user input in step 233) to obtain a customized module and Optionally display customized module
236
any more modules to customize?
yes
no
237
any more components to customize?
yes
no
238
Compile at least the customized module(s) to obtain an executable and store the executable in non-transitory memory
239
Execute the executable (including the customized module)
120
Database
Customization
112
Addn'l Software
113
200
One or more Computers

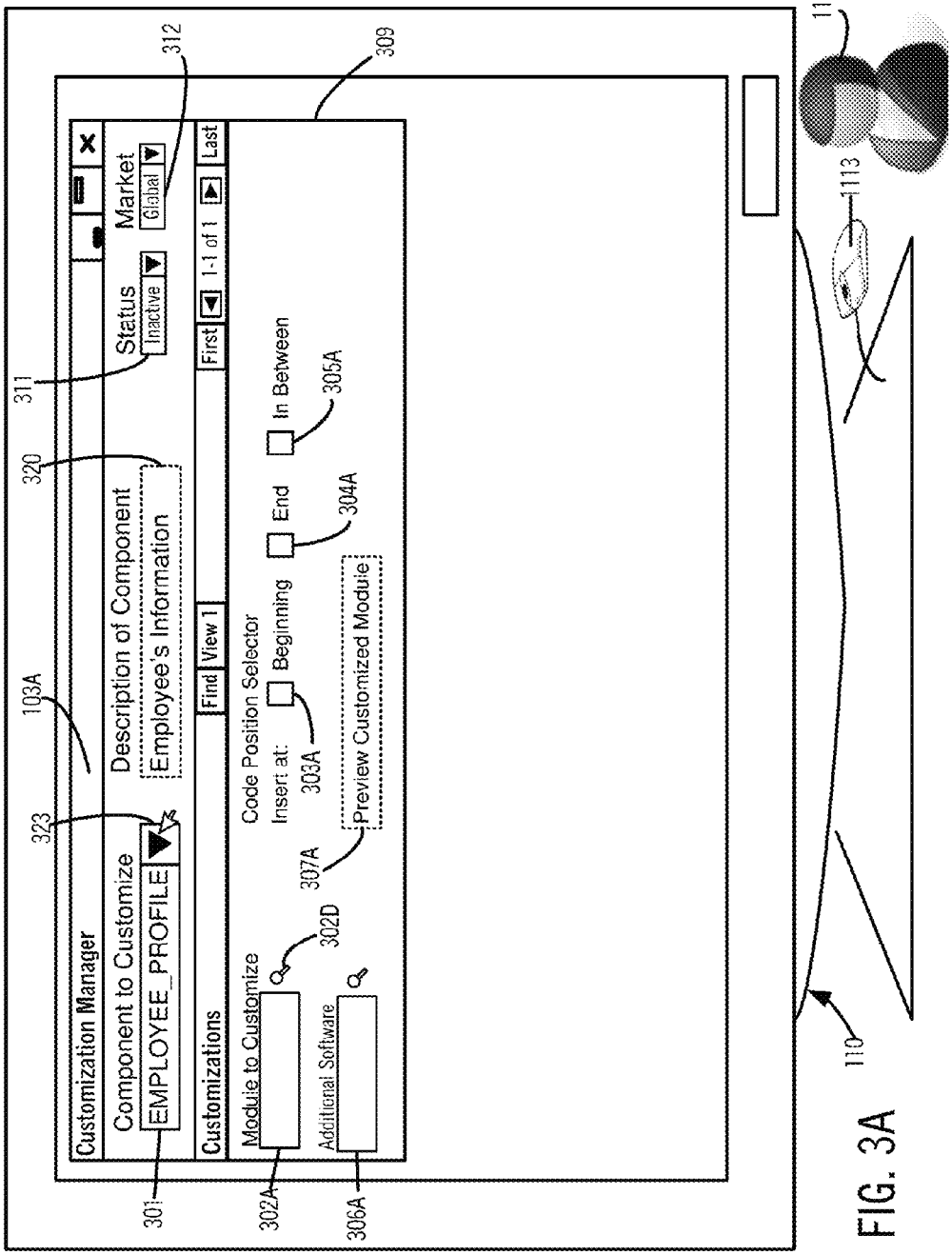

Customization Manager
Component to Customize
EMPLOYEE_PROFILE
Description of Component
Employee's Information
Status
Inactive
Market
Global
Customizations
Find
View 1
First
1-1 of 1
Last
Module to Customize
Additional Software
Code Position Selector
Insert at:
Beginning
End
In Between
Preview Customized Module
301
302A
302D
303A
304A
305A
306A
307A
309
311
312
320
323
103A
111
113
110

FIG. 3A

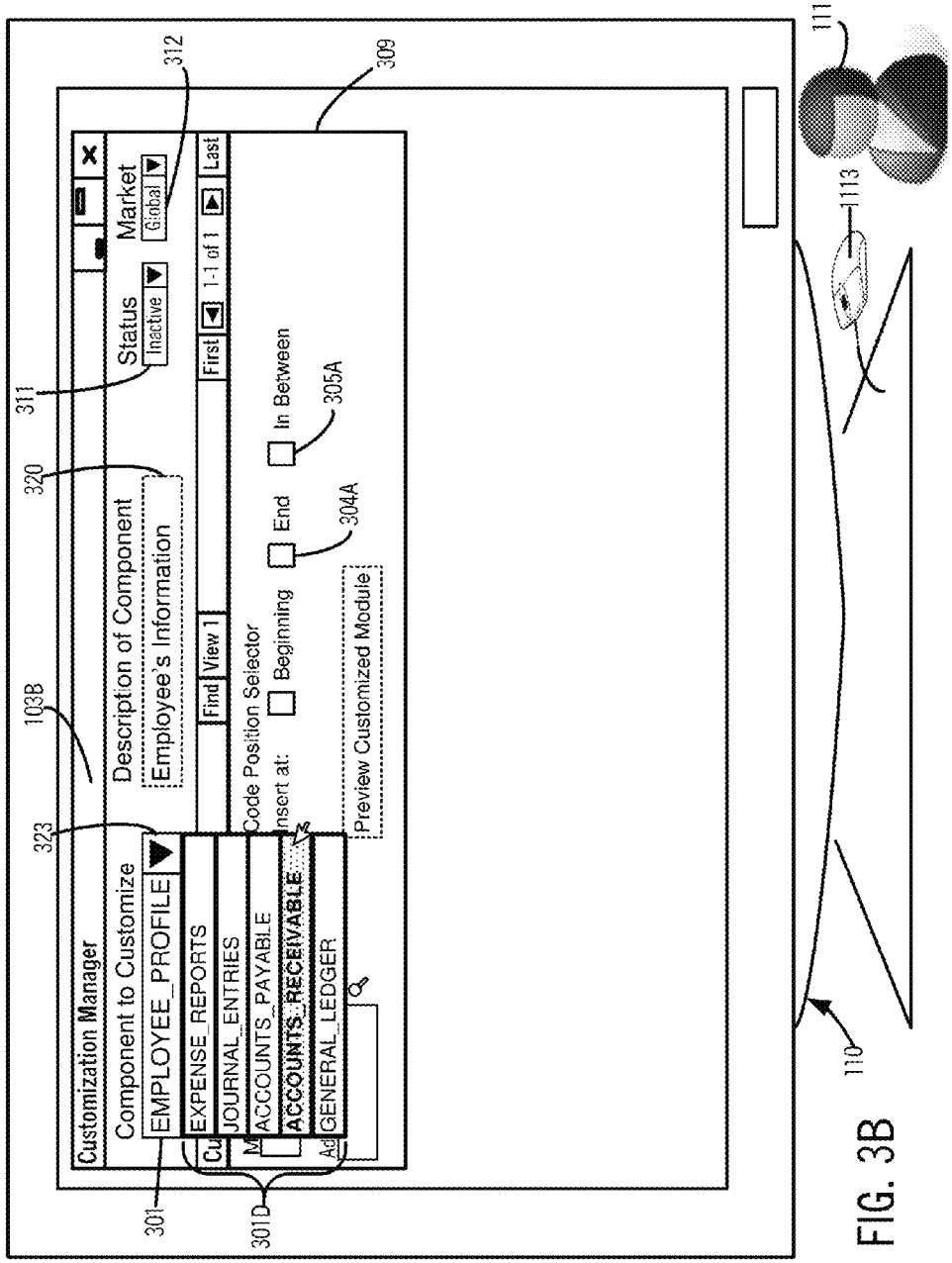

Customization Manager
Component to Customize
EMPLOYEE_PROFILE
EXPENSE_REPORTS
JOURNAL_ENTRIES
ACCOUNTS_PAYABLE
ACCOUNTS_RECEIVABLE
GENERAL_LEDGER
Description of Component
Employee's Information
Status
Inactive
Market
Global
Find
View 1
First
1-1 of 1
Last
Code Position Selector
Insert at:
Beginning
End
In Between
Preview Customized Module
301
301D
103B
323
320
311
312
309
304A
305A
111
113
110

FIG. 3B

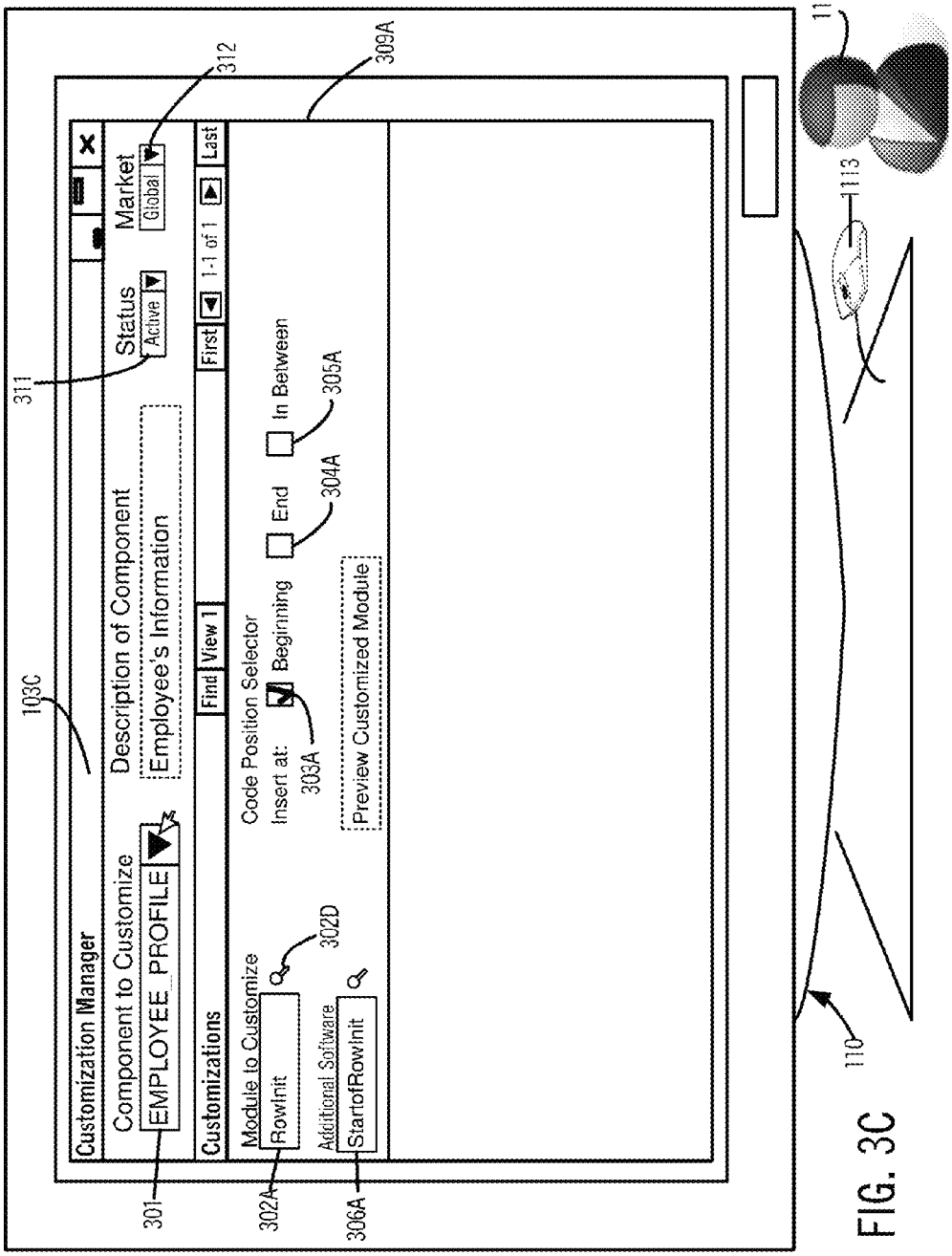

Customization Manager
Component to Customize
EMPLOYEE_PROFILE
Description of Component
Employee's Information
Status
Active
Market
Global
Customizations
Find
View 1
First
1-1 of 1
Last
Module to Customize
RowInit
Additional Software
StartofRowInit
Code Position Selector
Insert at:
Beginning
End
In Between
Preview Customized Module
103C
311
312
309A
301
302A
306A
302D
303A
304A
305A
111
113
110

FIG. 3C

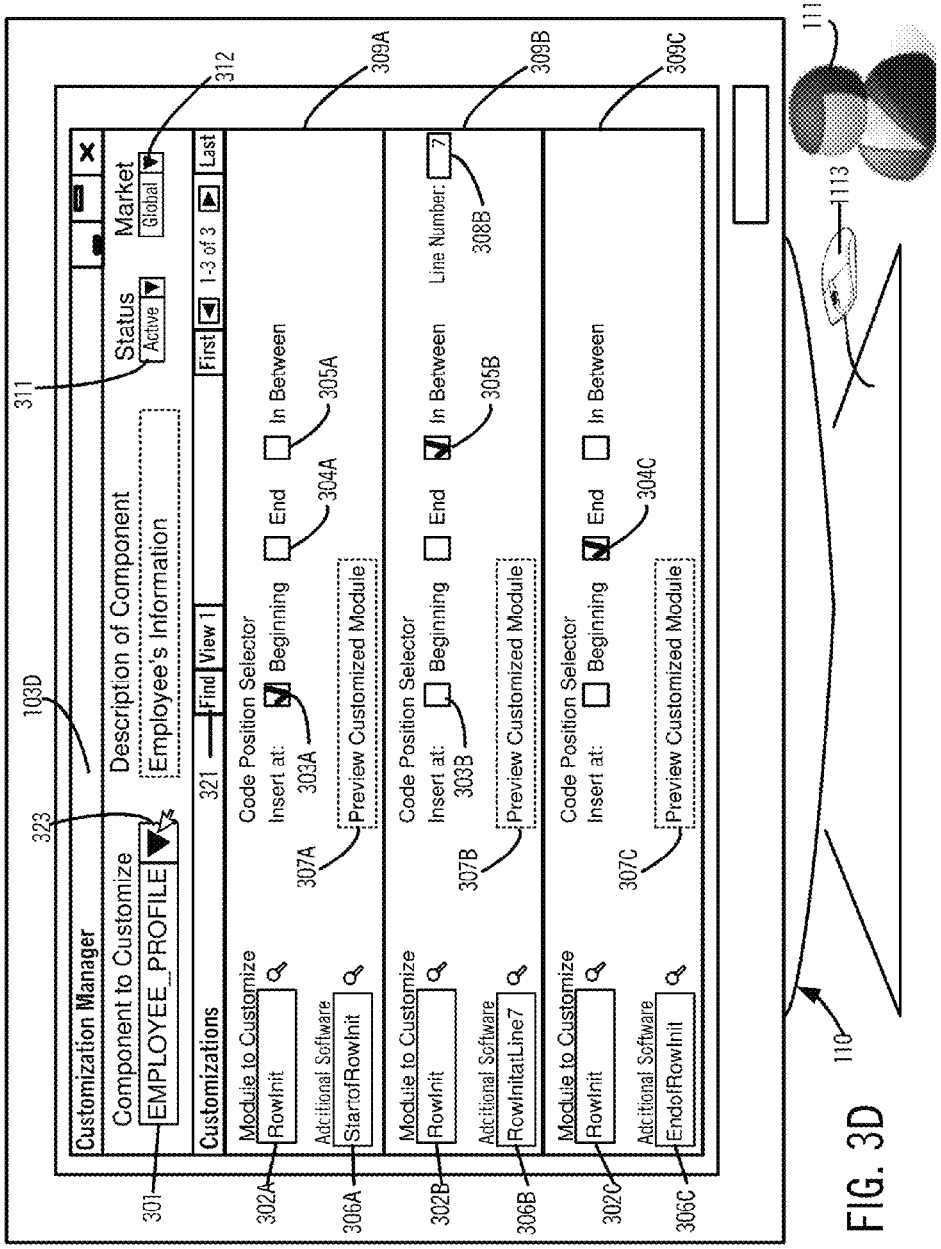

Customization Manager
Component to Customize
EMPLOYEE_PROFILE
Description of Component
Employee's Information
Status
Active
Market
Global
Customizations
Find
View 1
First
1-3 of 3
Last
Module to Customize
RowInit
Additional Software
StartofRowInit
Code Position Selector
Insert at:
Beginning
End
In Between
Preview Customized Module
Module to Customize
RowInit
Additional Software
RowInitatLine7
Code Position Selector
Insert at:
Beginning
End
In Between
Line Number:
7
Preview Customized Module
Module to Customize
RowInit
Additional Software
EndofRowInit
Code Position Selector
Insert at:
Beginning
End
In Between
Preview Customized Module
301
302A
302B
302C
303A
303B
304A
304C
305A
305B
306A
306B
306C
307A
307B
307C
308B
309A
309B
309C
311
312
323
103D
111
113
110

FIG. 3D

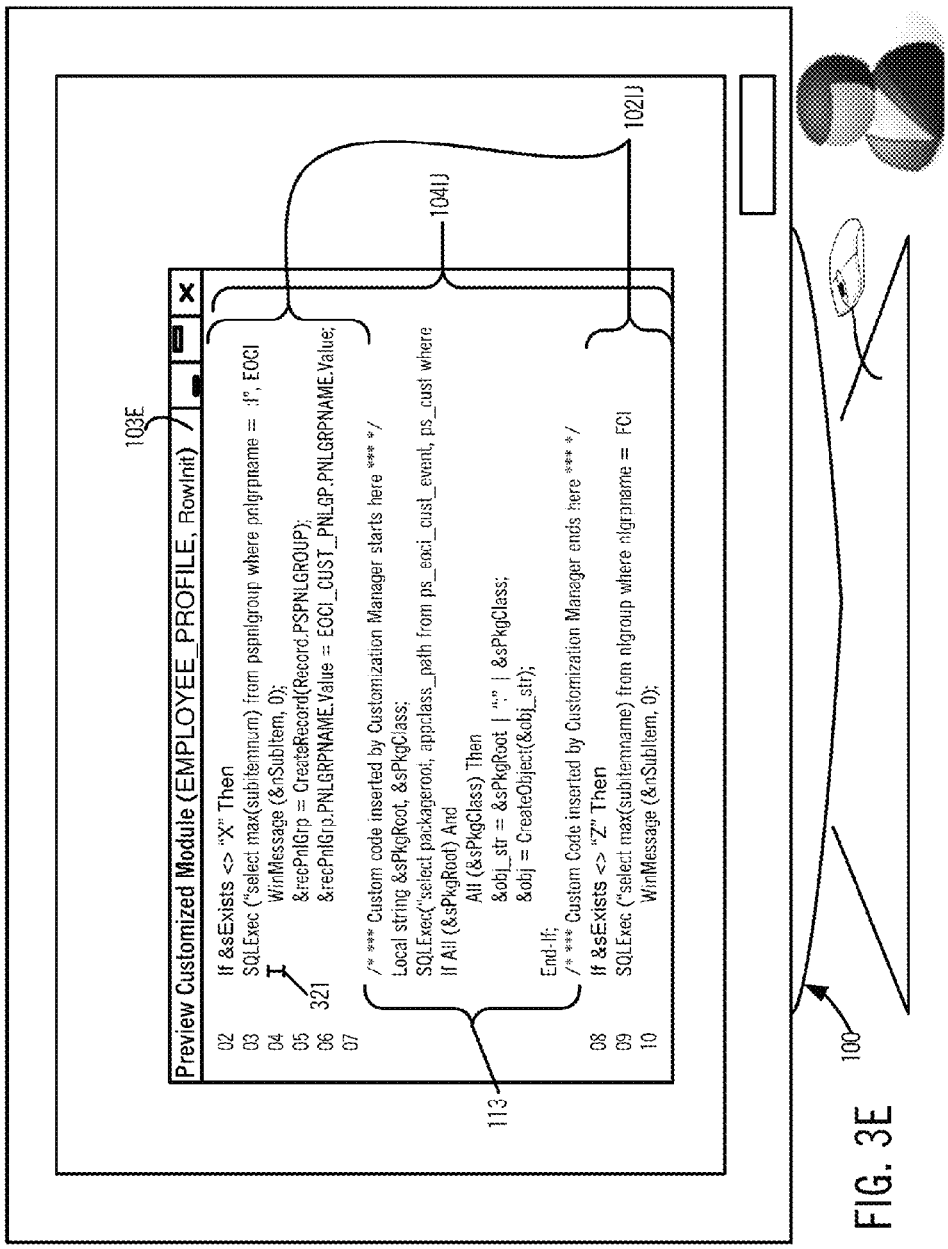

103E
Preview Customized Module (EMPLOYEE_PROFILE, RowInit)
02 If &sExists <> "X" Then
03 SQLExec ("select max(subitemnum) from pspnlgroup where pnlgrpname = :1", EOCI
04 WinMessage (&nSubItem, 0);
05 &recPnlGrp = CreateRecord(Record.PSPNLGROUP);
06 &recPnlGrp.PNLGRPNAME.Value = EOCI_CUST_PNLGP.PNLGRPNAME.Value;
07
/* *** Custom code inserted by Customization Manager starts here *** */
Local string &sPkgRoot, &sPkgClass;
SQLExec("select packageroot, appclass_path from ps_eoci_cust_event, ps_cust where
If All (&sPkgRoot) And
All (&sPkgClass) Then
&obj_str = &sPkgRoot | ":" | &sPkgClass;
&obj = CreateObject(&obj_str);
End-If;
/* *** Custom Code inserted by Customization Manager ends here *** */
08 If &sExists <> "Z" Then
09 SQLExec ("select max(subitemname) from nlgroup where nlgrpname = FCI
10 WinMessage (&nSubItem, 0);
321
113
1041
1021
100

FIG. 3E

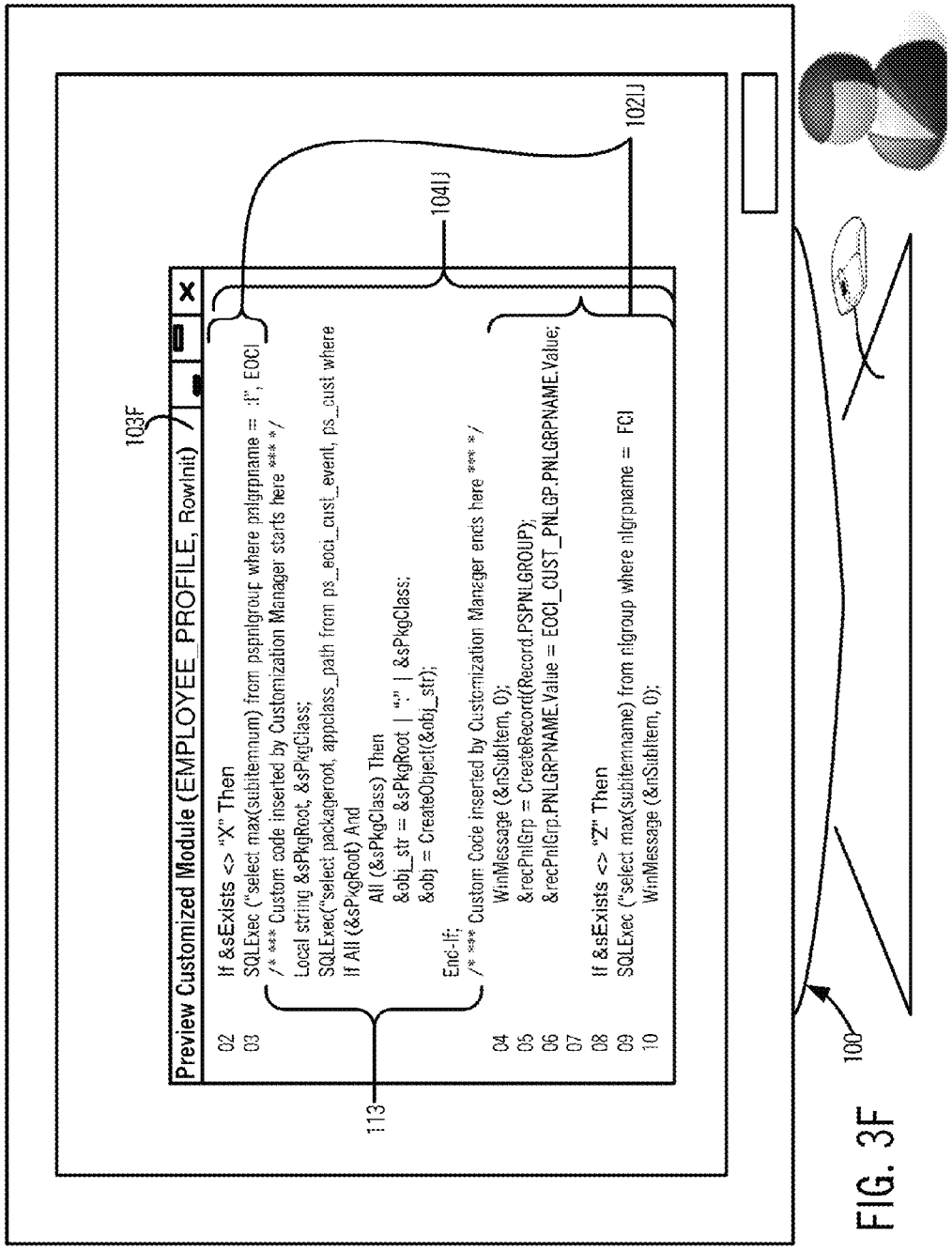

103F
Preview Customized Module (EMPLOYEE_PROFILE, RowInit)
02 If &sExists <> "X" Then
03 SQLExec ("select max(subitemnum) from psprilgroup where prilgrpname = :1", EOCI
/* *** Custom code inserted by Customization Manager starts here *** */
Local string &sPkgRoot, &sPkgClass;
SQLExec("select packageroot, appclass_path from ps_eoci_cust_event, ps_cust where
If All (&sPkgRoot) And
All (&sPkgClass) Then
&obj_str = &sPkgRoot | ":" | &sPkgClass;
&obj = CreateObject(&obj_str);
End-If;
/* *** Custom Code inserted by Customization Manager ends here *** */
04 WinMessage (&nSubItem, 0);
05 &recPrilGrp = CreateRecord(Record.PSPNLGROUP);
06 &recPrilGrp.PNLGRPNAME.Value = EOCI_CUST_PNLGP.PNLGRPNAME.Value;
07
08 If &sExists <> "Z" Then
09 SQLExec ("select max(subitemname) from nlgroup where nlgrpname = FCI
10 WinMessage (&nSubItem, 0);
113
1041J
1021J
100

FIG. 3F

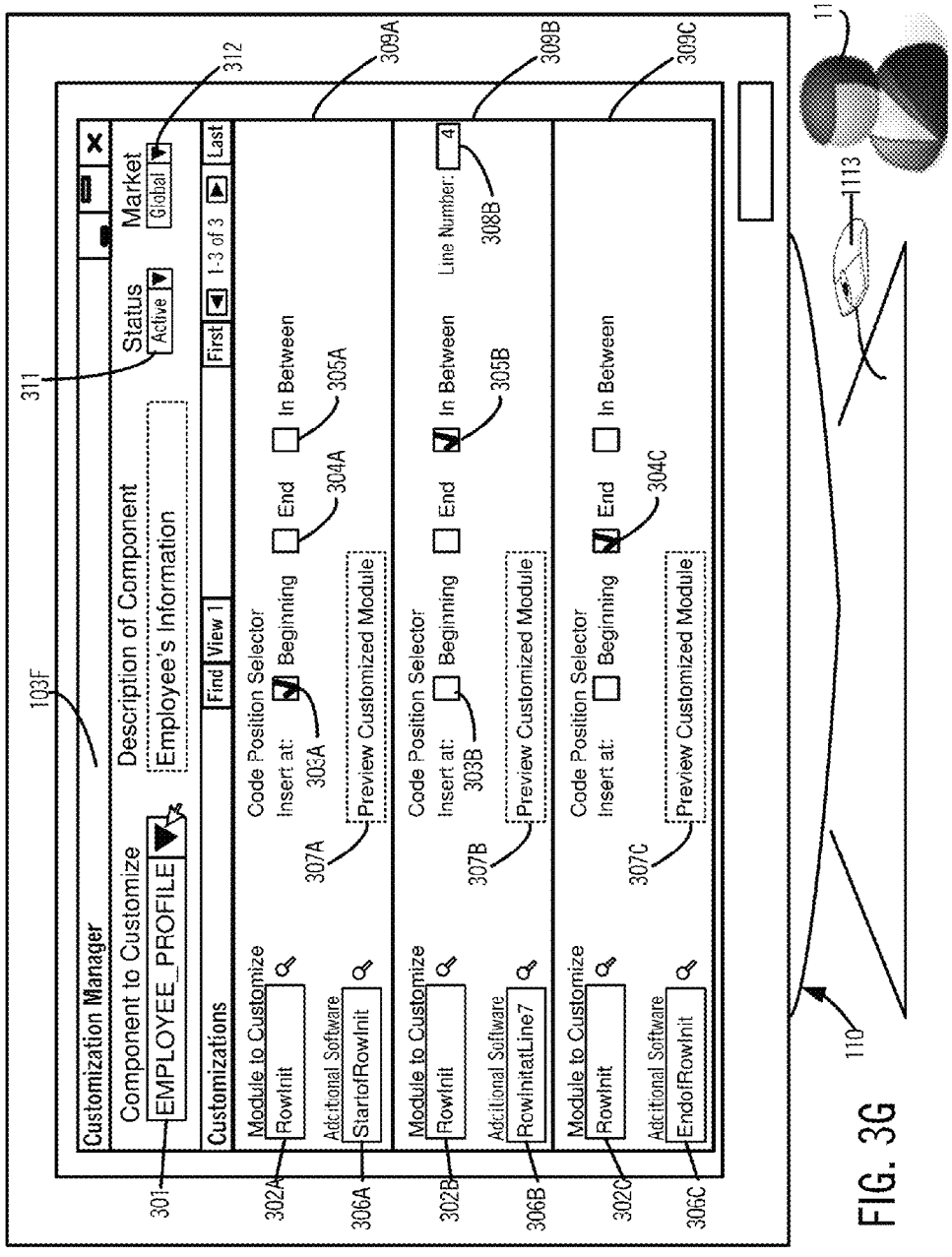

Customization Manager
Component to Customize
EMPLOYEE_PROFILE
Description of Component
Employee's Information
Status
Active
Market
Global
Customizations
Find
View 1
First
1-3 of 3
Last
Module to Customize
RowInit
Additional Software
StartofRowInit
Code Position Selector
Insert at:
Beginning
End
In Between
Preview Customized Module
Module to Customize
RowInit
Additional Software
RowInitatLine7
Code Position Selector
Insert at:
Beginning
End
In Between
Line Number:
4
Preview Customized Module
Module to Customize
RowInit
Additional Software
EndofRowInit
Code Position Selector
Insert at:
Beginning
End
In Between
Preview Customized Module
301
103F
311
312
302A
306A
307A
303A
304A
305A
309A
308B
302B
306B
307B
303B
304B
305B
309B
302C
306C
307C
304C
309C
110
111
113

FIG. 3G

FIG. 4A

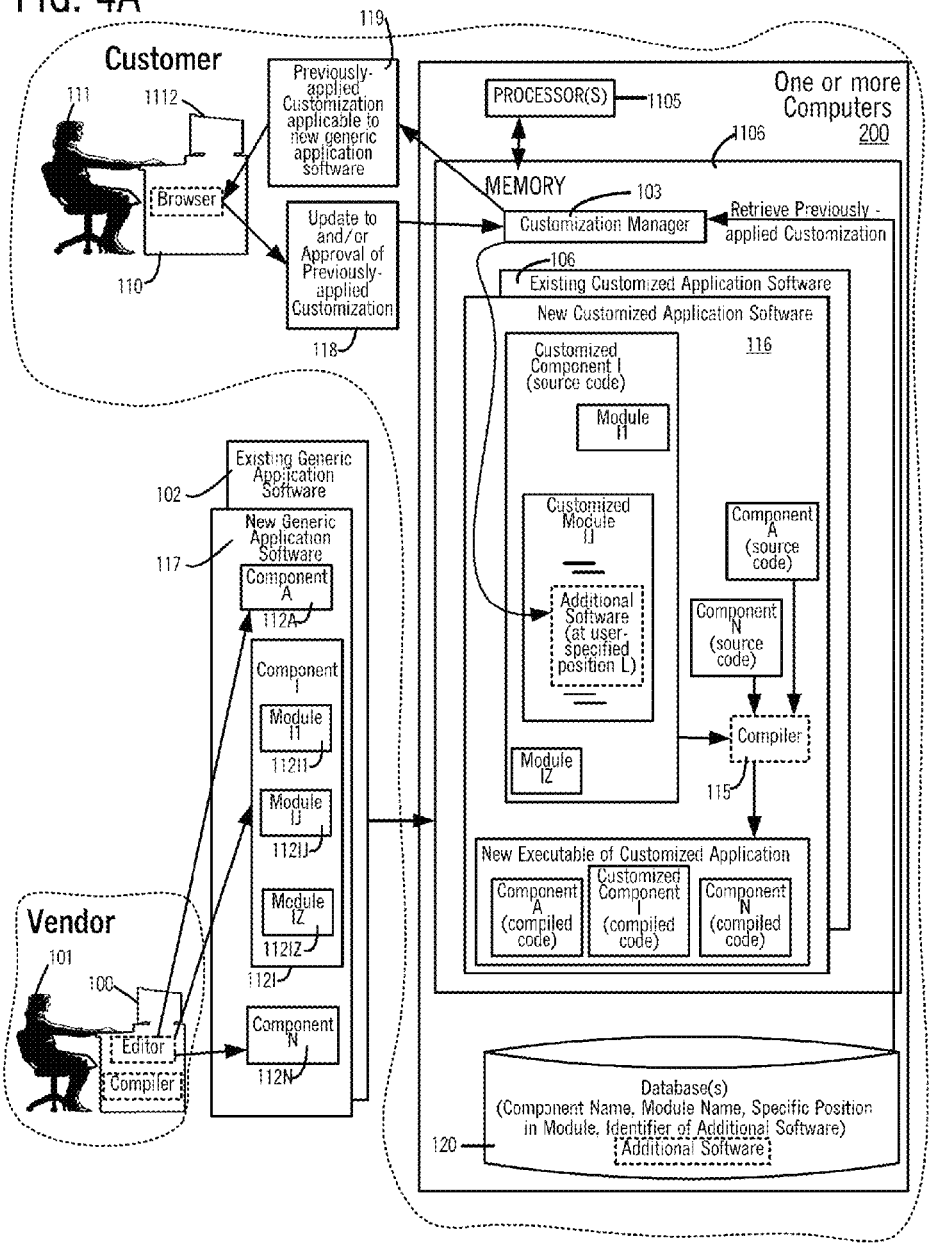
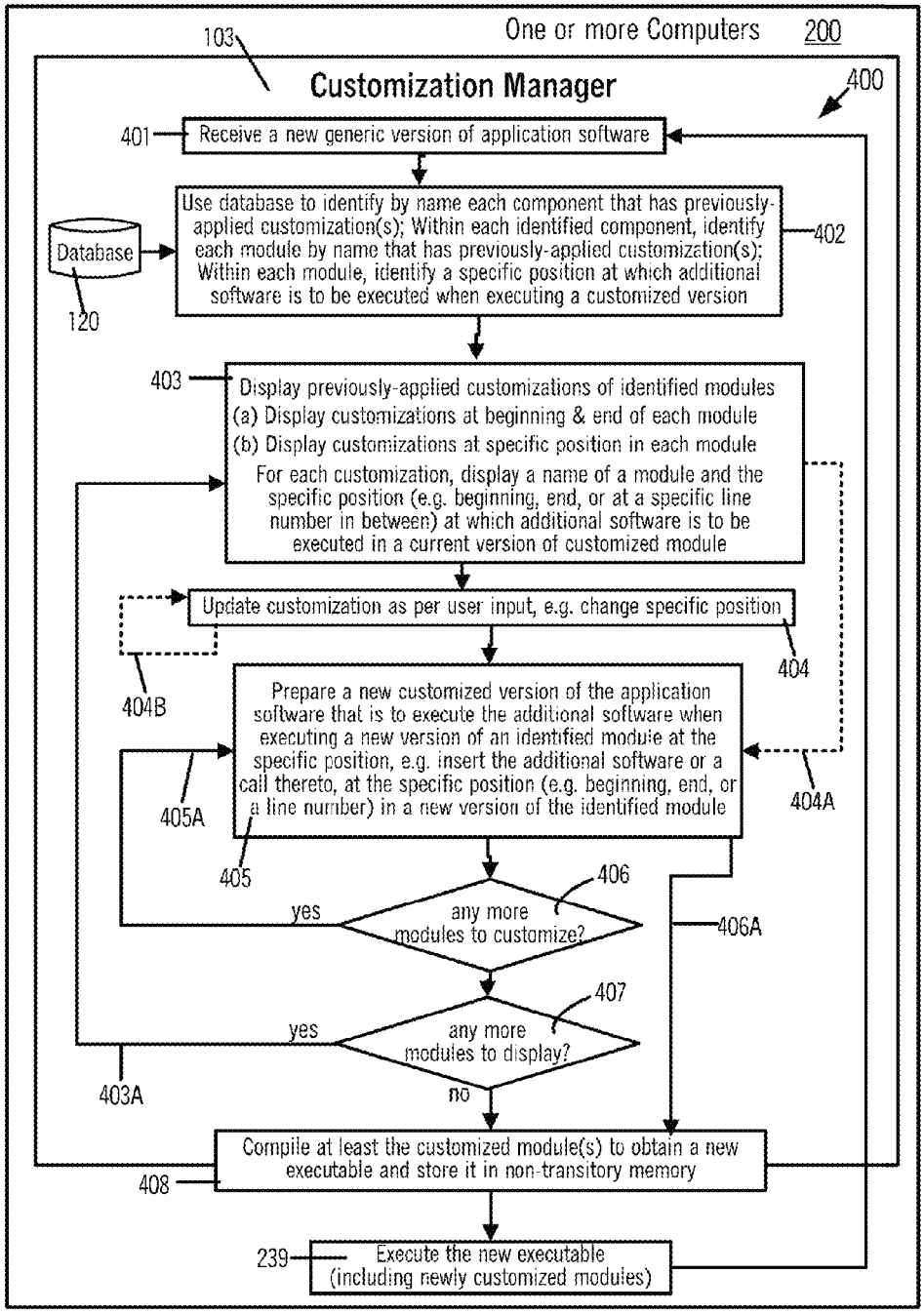

Customer
111
1112
Browser
110
119
Previously-applied Customization applicable to new generic application software
Update to and/or Approval of Previously-applied Customization
118
One or more Computers 200
PROCESSOR(S)
1105
1106
MEMORY
103
Customization Manager
Retrieve Previously-applied Customization
106
Existing Customized Application Software
New Customized Application Software
116
Customized Component I (source code)
Module I1
Customized Module IJ
Additional Software (at user-specified position L)
Module IZ
Component A (source code)
Component N (source code)
Compiler
115
New Executable of Customized Application
Component A (compiled code)
Customized Component I (compiled code)
Component N (compiled code)
Existing Generic Application Software
102
New Generic Application Software
117
Component A
112A
Component I
Module I1
112I1
Module IJ
112IJ
Module IZ
112IZ
112I
Component N
112N
Vendor
101
100
Editor
Compiler
Database(s)
(Component Name, Module Name, Specific Position in Module, Identifier of Additional Software)
Additional Software
120

FIG. 4B


One or more Computers 200
103
Customization Manager
400
401
Receive a new generic version of application software
Use database to identify by name each component that has previously-applied customization(s); Within each identified component, identify each module by name that has previously-applied customization(s); Within each module, identify a specific position at which additional software is to be executed when executing a customized version
402
Database
120
403
Display previously-applied customizations of identified modules
(a) Display customizations at beginning & end of each module
(b) Display customizations at specific position in each module
For each customization, display a name of a module and the specific position (e.g. beginning, end, or at a specific line number in between) at which additional software is to be executed in a current version of customized module
Update customization as per user input, e.g. change specific position
404
404B
Prepare a new customized version of the application software that is to execute the additional software when executing a new version of an identified module at the specific position, e.g. insert the additional software or a call thereto, at the specific position (e.g. beginning, end, or a line number) in a new version of the identified module
404A
405A
405
406
yes
any more modules to customize?
406A
407
yes
any more modules to display?
403A
no
Compile at least the customized module(s) to obtain a new executable and store it in non-transitory memory
408
239
Execute the new executable (including newly customized modules)

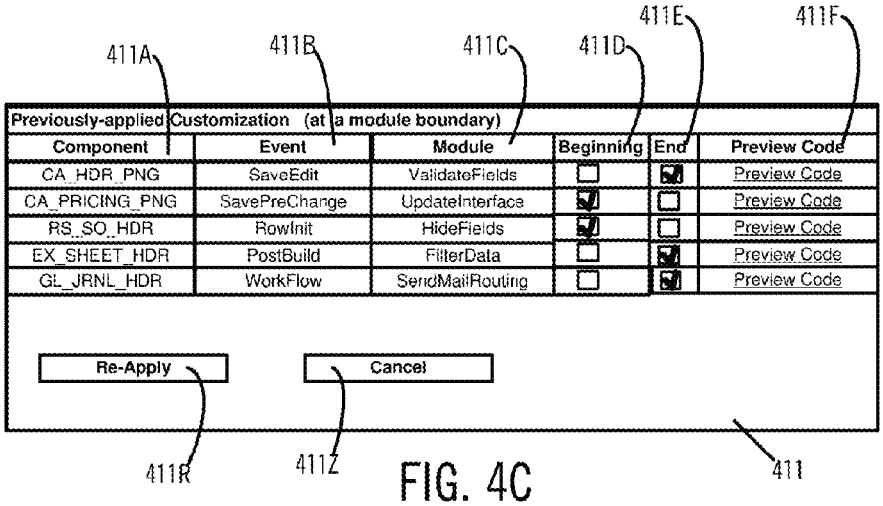

411A
411B
411C
411D
411E
411F
Previously-applied Customization (at a module boundary)
Component
Event
Module
Beginning
End
Preview Code
CA_HDR_PNG
SaveEdit
ValidateFields
Preview Code
CA_PRICING_PNG
SavePreChange
UpdateInterface
Preview Code
RS_SO_HDR
RowInit
HideFields
Preview Code
EX_SHEET_HDR
PostBuild
FilterData
Preview Code
GL_JRNL_HDR
WorkFlow
SendMailRouting
Preview Code
Re-Apply
Cancel
411R
411Z
411

FIG. 4C

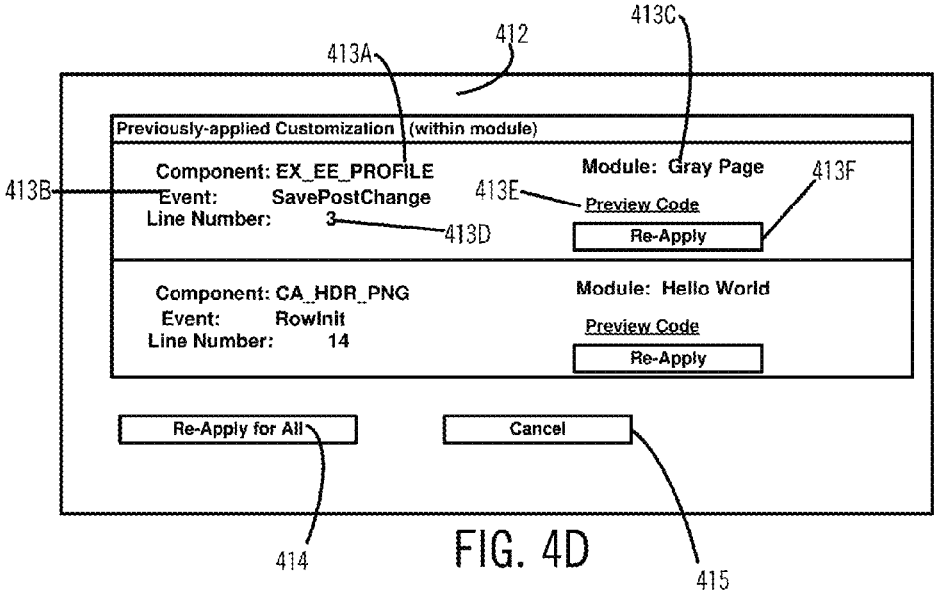

413C
412
413A
Previously-applied Customization (within module)
Component: EX_EE_PROFILE
Event: SavePostChange
Line Number: 3
Module: Gray Page
413B
413E
413F
Preview Code
Re-Apply
413D
Component: CA_HDR_PNG
Event: RowInit
Line Number: 14
Module: Hello World
Preview Code
Re-Apply
Re-Apply for All
Cancel
414
415

FIG. 4D

FIG. 5A

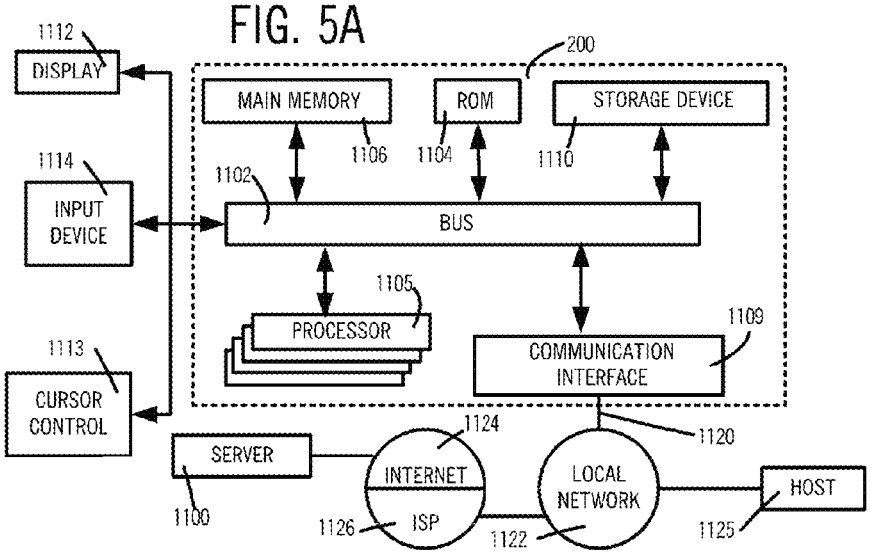

1112
DISPLAY
200
MAIN MEMORY
ROM
STORAGE DEVICE
1106
1104
1110
1114
INPUT DEVICE
1102
BUS
1105
PROCESSOR
1109
COMMUNICATION INTERFACE
1113
CURSOR CONTROL
1124
1120
SERVER
INTERNET
LOCAL NETWORK
HOST
1100
1126
ISP
1122
1125

FIG. 5B

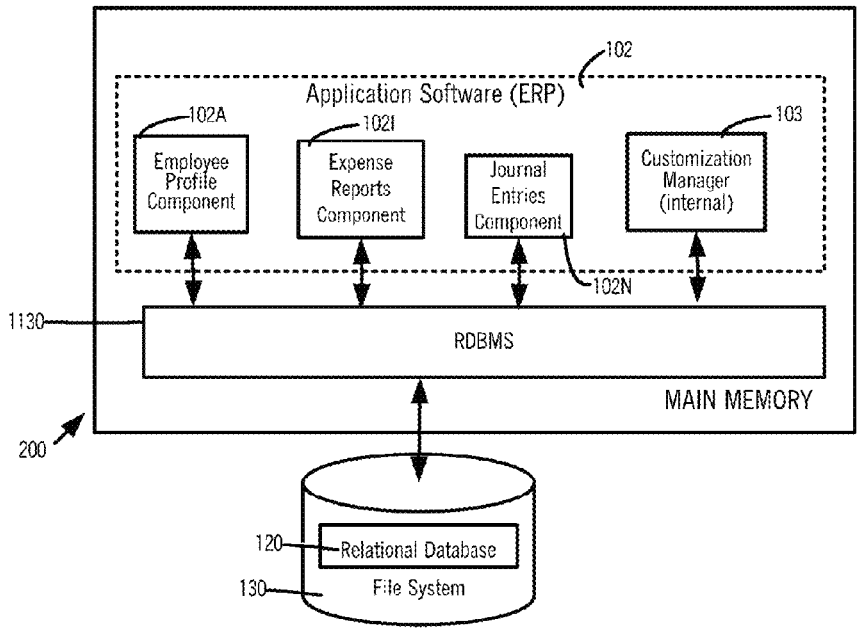
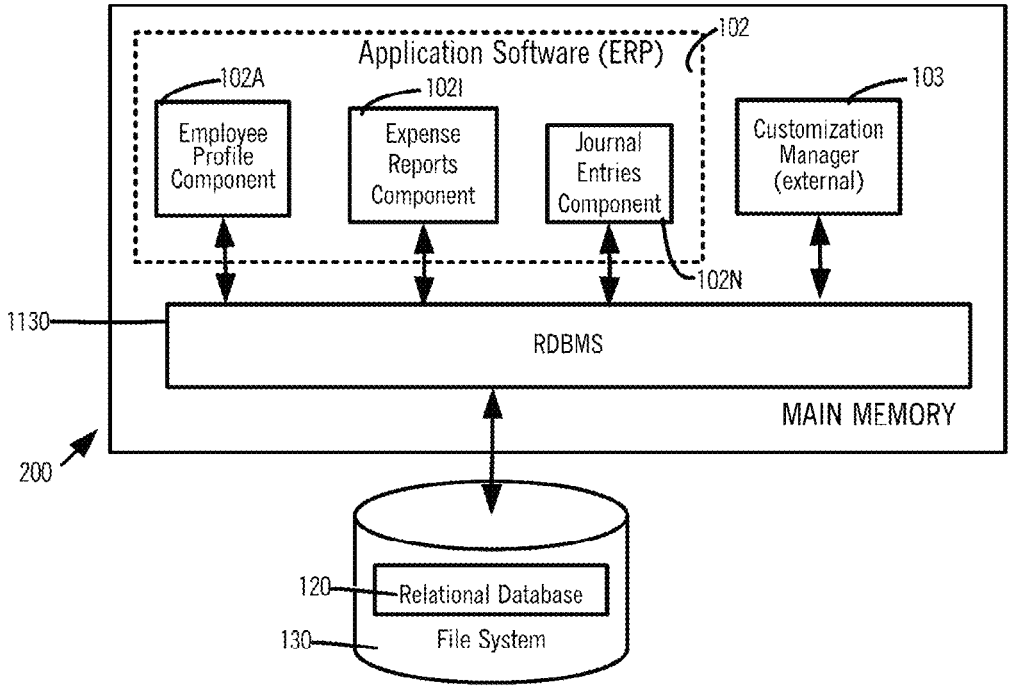

102
Application Software (ERP)
102A
102I
103
Employee Profile Component
Expense Reports Component
Journal Entries Component
Customization Manager (internal)
102N
1130
RDBMS
MAIN MEMORY
200
120
Relational Database
130
File System

FIG. 5C


Application Software (ERP)
102
102A
102I
103
Employee Profile Component
Expense Reports Component
Journal Entries Component
Customization Manager (external)
102N
1130
RDBMS
MAIN MEMORY
200
120
Relational Database
130
File System

CUSTOMIZATION MANAGER

FIELD

This patent application relates to apparatuses, methods and non-transitory computer-readable storage media that customize original software delivered by a vendor to a customer, and then execute modified software which is obtained by customization.

BACKGROUND

Most software delivered by a software vendor typically meets the needs of a customer. Some customers have their own requirements, which are unique to their business. Hence, software delivered by a vendor may be customized, to fit a customer's specific needs. However, customization of a vendor's software acts as a barrier to upgrading, applying patches or maintaining software by the vendor. This is because a bug fix or patch provided by the vendor is typically based on an initial version which the vendor supplied to the customer, not accounting for any customization of the vendor-supplied software at a customer's premises. If a customer applies a patch or fix from the vendor, one or more customizations of the initial version which are made by the customer may get overwritten by a new version from the vendor. This makes applying patches or fixes or even upgrading to a latest version difficult for customers.

When customized software is to be upgraded by a fix supplied by a vendor, manual effort is required at the customer's premises, to maintain previously applied customization(s). Specifically, during the upgrade process, a customer needs to manually review and identify all vendor-supplied modules where any customization has been applied. Then, the customer has to make a copy of any custom code they added to the vendor-supplied modules, and then apply the fix or patch delivered by the vendor. After the fix or patch is applied, the customer must use the custom code copy to re-apply their customizations to new versions of the vendor-supplied modules.

Due to the time and cost involved in the upgrade process, many customers refrain from upgrading an initial version of vendor-supplied modules, by not applying patches, fixes, maintenance packages, upgrade codes etc. This traps the customer into staying with an old version of the vendor-supplied software, losing benefits of new features and enhancements, even though a latest and powerful version is available in the market. The inventors of the current patent application believe that there is a need for apparatuses, methods and non-transitory computer-readable storage media of the type described below, to improve the process of applying customizations to vendor-supplied software, as described below.

SUMMARY

In several described embodiments, one or more computers store in a database, a customization which indicates how application software is to be customized. Specifically, the customization includes a name of a module of source code in a generic version of application software, a specific position within the module, and a name of a file which contains additional software. Depending on the embodiment, such a customization may additionally include other information, such as a name of a component of the application software to which the module being customized belongs, and one or more geographic locale(s) in which the customization is applicable.

The customization may be received in the form of input from a human user, via fields in one or more screens of a graphical user interface (GUI).

In many of the described embodiments, one or more computers additionally receive application software from a vendor in a form (also called "generic version") that is commonly supplied to several customers. After receipt of a generic version of the application software, the one or more computers apply one or more customization(s) of the type described in the previous paragraph above, specifically by preparing and storing in one or more non-transitory computer-readable storage media, a customized version of the application software. The customized version of the application software executes the above-described additional software (at the specific position identified in the customization), whenever the generic version of the application software is executed.

A customized version of the application software may be prepared by insertion of the additional software directly into the application software, or by insertion of a function call that invokes execution of the additional software, depending on the embodiment. The additional software(s) identified by customization(s) and the application software may both be in the form of source code in some embodiments, in which case the customized version of the application software is compiled, to obtain one or more executable(s), which are then executed in the normal manner thereby executing the existing customized version. In other embodiments, the additional software(s) and the application software may both be in the form of object code, in which case no compilation is needed after customization, to execute a customized application software.

The above-described customization(s) are stored in a database in non-transitory computer-readable storage media, after one generic version of the application software ("existing generic application software") has been customized, for future use when a new generic version of the application software is received. Hence, customizations that were previously applied to prepare an existing customized version of the application software are retrieved from the database after receipt of a new version of the generic application software. Depending on the embodiment, a customer's computer(s) may issue a database query (e.g. in SQL) based on module names in a new generic version of application software being identical to corresponding module names in previously-applied customizations (which include module names of the existing generic version). The retrieved customizations are identified in a screen prepared for display to a human user, followed optionally by updating the customizations based on user input. Then, the retrieved customizations which are approved by user input (with or without update) are applied to the new generic version of application software, e.g. by inserting additional source code(s) (directly or indirectly via a function call) into the module(s) of the new generic version, to obtain a new customized version that executes the additional software when executing the new generic version. In embodiments wherein the new customized version is in source code form, it is then compiled to obtain new executable(s), followed by executing the new executable(s) in the normal manner.

It is to be understood that several other aspects of the described embodiments will become readily apparent to those skilled in the art from the description herein, wherein it is shown and described various aspects by way of illustration. The drawings and detailed description below are to be regarded as illustrative in nature and not as restrictive.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. **1**A and **1**B show, in data flow diagrams, a computer of a vendor that transmits generic application software to one

or more computers in a cloud, and computer(s) of customer(s) transmitting to the cloud computer(s), customization(s) indicative of when additional software is to be executed in executing the generic application software, in some illustrative embodiments.

FIG. **2** illustrates, in a flow chart, acts performed by one or more computers **200** by use of one or more processors programmed with a sequence of instructions of software stored in one or more memories, to implement a customization manager, in exemplary embodiments in accordance with the invention.

FIGS. **3**A-**3**G illustrate screens generated by one or more computers **200** in performing acts of the type illustrated in FIG. **2**.

FIG. **4**A shows, in a data flow diagram vendor's computer **100** transmitting to customer's computer(s) **200**, one version of application software **102** ("existing generic application software") customized by customizations as described above in reference to FIGS. **1**A and **1**B, followed transmission of another version of application software **112** ("new generic application software") customized by previously-applied customizations that may be approved unchanged or after being updated by user input, in some illustrative embodiments.

FIG. **4**B illustrates, in a flow chart, acts performed by one or more computers **200** (in addition to the acts of FIG. **2**) by use of one or more processors programmed with a sequence of instructions of software stored in one or more memories, to customize a new version of application software based on previously-applied customizations that may be approved unchanged or approved after update in exemplary embodiments of a customization manager, in accordance with the invention.

FIGS. **4**C and **4**D illustrate screens generated by one or more computers **200** in performing acts of the type illustrated in FIG. **4**B.

FIG. **5**A illustrates, in a block diagram, hardware portions of one or more computers **200** programmed with software portions of the type illustrated in FIG. **5**B or **5**C to perform one or more acts illustrated in FIGS. **2** and **4**B in some embodiments.

FIGS. **5**B and **5**C illustrate, in block diagrams of alternative embodiments, one or more computers **200** of the type shown in FIG. **5**A programmed with software to perform one or more acts illustrated in FIGS. **2** and **4**B, in a customization manager **102** that is either internal to or external to application software **102**.

DETAILED DESCRIPTION

In accordance with the invention, an employee **101** (FIG. **1**A) of a software vendor (e.g. Oracle Corporation or SAP AG) prepares in a computer **100**, certain software "application software") **102** for use by employees of multiple customers, e.g. employees **111**A and **111**B of respective customers A and B. Application software **102** is "generic" and designed for use by any number of multiple customers (although only two customers are shown in FIG. **1**A for illustration). Application software **102** (FIG. **1**A) includes logic to perform one or more business functions in an organization, such as logic used by each customer to perform Enterprise Resource Planning ("ERP"), e.g. software to manage each customer's own customers called "Customer Relationship Management (CRM)", software to manage each customer's own suppliers, called "Supply Chain Management (SCM)" etc.

As shown in FIG. **1**A, software vendor's computer **100** transmits application software **102** to one or more computers (also called "server" computers) **200** that may implement a "cloud" **300**. In cloud **300**, one or more computers **200** may be owned and managed by various entities, e.g. by customer(s), and/or by the vendor, and/or by a third party, depending on the embodiment. In some embodiments, vendor's computer **100** additionally transmits to cloud or server computer(s) **200**, software **103** which is to be used in customizing application software **102**, hereinafter "customization manager." In some embodiments, customization manager **103** is transmitted by vendor's computer **100** to cloud computer(s) **200** separate from and independent of transmission of application software **102** as shown in FIG. **1**A, although in certain embodiments customization manager **103** is an integral portion of application software **102** and transmitted together as shown in FIG. **1**B. In the just-described certain embodiments shown in FIG. **1**B, customization manager **103** being an integral portion of application software **102** makes upgrade of application software **102** easy, e.g. by eliminating the need for employee **111** to invoke customization manager **103**, and eliminating the need to login to customization manager **103**, etc. In the just-described certain embodiments shown in FIG. **1**B, screens of customization manager **103** are formatted with look and feel similar or identical to screens of application software **102** to provide a seamless experience to employee **111**, when customizing and upgrading application software **102**.

The one or more cloud or server computers **200** additionally receive, from computer(s) **110**A and **110**B of the respective customers A and B, additional software(s) **113**A and **113**B which are to be executed when executing the generic version of the application software at specific positions thereof as identified by respective customizations **112**A and **112**B. Customization manager **103** (FIG. **1**A), when executed by the cloud or server computer(s) **200**, prepares a customized version of application software **102** by insertion of the additional software directly into the application software, or by insertion of a function call that invokes execution of the additional software, depending on the embodiment. For example, customized application software **102**A (FIG. **1**A) is created by insertion of additional software(s) **113**A directly or via a function call into application software **102** at specific position(s) identified by customization **112**A, while customized application software **102**B (FIG. **1**A) is created by insertion of additional software(s) **113**B directly or via a function call into application software **102** at specific position(s) identified by customization **112**B.

The customized application softwares **102**A and **102**B are thereafter used by employees **111**A and **111**B of respective customers A and B via local computers **110**A and **110**B in the normal manner, to receive and view display of information in the form of respective outputs **114**A, **114**B (FIG. **1**A). Execution of additional software(s) **113**A and **113**B by cloud or server computer(s) **200** when executing the generic version of the application software generates different information as outputs **114**A, **114**B which may be displayed in a graphical user interface (via a browser) on the respective video display monitors of local computers **110**A and **110**B used by employees **111**A and **111**B. The specific manner in which application software **102** is customized by computer(s) **200**, to generate the information displayed to one customer's employee **111** is described next, in reference to FIG. **1**B.

Application software **102** (FIG. **1**B) which is supplied generically by vendor's computer **100** to multiple customers includes multiple components A . . . I . . . N in the normal manner, and each component I include multiple modules, such as modules I1 . . . IJ . . . IZ. Application software **102** is not componentized in some embodiments, in which case application software **102** directly includes modules, without

grouping into components. As noted above, customization manager **103** is used in computer(s) **200** to receive, store and use one or more customization(s) **112** (FIG. 1B) that customize one or more of components **102**A . . . **102**I . . . **102**N. In some embodiments, customization manager **103** adds the additional software **113** (FIG. 1B) in source code form ("additional source code"), based on each customer's individual requirements.

Specifically, in several embodiments, an employee **111** of a customer prepares additional source code **113** (FIG. 1B) in their local computer **110**, and supplies it to computer(s) **200** with a corresponding customization **112** that specifically identifies the additional source code **113** and further identifies a specific position at which it is to be executed in application software **102**. In many embodiments, customization **112** is an n-tuple (e.g. a 3-tuple or a 4-tuple) that specifies when additional source code **113** is to be executed in computer(s) **200** in executing generic application software **102** received by computer(s) **200** from the vendor's computer **100**.

As noted above, in several embodiments, each component I in an application software **122** (also called "generic application software") includes several modules, such as modules I**1** . . . IJ . . . IZ. In such embodiments, a customization **112** uniquely identifies one specific module therein, e.g. module IJ. Depending on the embodiment, in order to uniquely identify a module IJ, customization **112** may further identify within generic application software **102** a specific component I in which module IJ is included. In addition, customization **112** of several embodiments identifies a specific position in the identified module IJ, at which the additional software **113** is to be executed. A specific position identified by user input received for customization **112** (either via a keyboard or via a mouse, as described elsewhere herein) may provide an indication, for example, (1) at a beginning of module IJ, e.g. beginning position **104**IJB before the very first instruction in module IJ, or (2) at an end of module IJ, e.g. end position **104**IJE after the very last instruction in module IJ, or (3) at a specific line number L within module U. The indication of line number L is after a beginning position **104**IJB in module IJ (i.e. after line number **1**) and before an ending position **104**IJE in module IJ (i.e. before a total number T of lines of instructions in source code form in module IJ). Thus the line number L is an indication of a specific position after line number **1** of the first line in module IJ and before line number T of the last line of instructions in source code form in module IJ, i.e. 1<L<T.

Customization **112** of some embodiments may be implemented as a 3-tuple which includes: (1) a name of module IJ of source code in application software **102**, (2) an indication of a specific position in the module IJ (e.g. line **7**, or a beginning position **104**IJB or end position **104**IJE), and (3) a name of a file which contains additional software in source code form. In one illustrative example, a file which contains additional software in source code form ("additional source code") is named RowInitatLine**7** and a 3-tuple form of customization **112** is (RowInit, Line **7**, RowInitatLine**7**), wherein "RowInit" uniquely identifies a specific module in the application software **102**.

As noted above, in some embodiments, customization **112** is implemented to include a name of a component I that includes module U. Hence, when implemented as a 3-tuple, such a customization **112** includes the module name and the component name in a single text string, with the two names being demarcated by a slash (or another such predetermined character) therebetween, thereby to form a single element of the 3-tuple. For example, if a module RowInit in the component EMPLOYEE_PROFILE is to be customized, a 3-tuple form of customization **112** is (EMPLOYEE_PROFILE/RowInit, Line **7**, RowInitatLine**7**). Many embodiments implement customization **112** as a 4-tuple in which the module name is one element of the 4-tuple and the component name is another element of the 4-tuple, an example of which is: (EMPLOYEE_PROFILE, RowInit, Line **7**, RowInitatLine**7**). In some embodiments, elements of a tuple that implement customization **112** may include not only the above-described name(s), but also paths, e.g. an element of such a tuple that includes a file name RowInitatLine**7** to identify the additional source code may include therein a directory or folder, and a path thereto which is local or remote (e.g. URL), as apparent in view of this description.

In several embodiments, the "n" elements of a tuple in a customization **112** are received as user input by computer(s) **200** via corresponding "n" or more fields in a graphical user interface (GUI) screen. Such a GUI screen is implemented in some embodiments in the form of a web page prepared by customization manager **103** in computer(s) **200** and displayed to customer's employee **111** by a browser in computer **110**. Hence, in an act **231** (FIG. **2**), customization manager **103** of some embodiments receives, via a field in the GUI screen, a name of a component, e.g. component I. And, in an act **232**, customization manager **103** receives, via another field in the GUI screen, a name of a module, e.g. module IJ in the component I (as noted above, component I was specified by user input received in act **231**). In an act **233**, customization manager **103** receives, via still another field in the GUI screen, an indication of a specific position in the module IJ, e.g. beginning position **104**IJB, in-between position at line number L or end position **104**IJE (as noted above, module IJ was specified by user input received in act **232**). Moreover, in an act **234**, customization manager **103** receives, via yet another field in the GUI screen, at least a name of a file containing the additional source code **113** (to be added to module IJ).

At the end of act **234**, several embodiments of customization manager **103** stores in a database **120**, the information received as user input in acts **231**-**234** as being associated with one another, namely as a customization **112** in database **120**. Customization **112** is stored in a predetermined data structure in database **120**, e.g. when database **120** is implemented as a hierarchical database in some embodiments, while in other embodiments customization **112** is stored in a row of a table in database **120**, with one column for each element of the n-tuple in customization **112**, e.g. when database **120** is implemented as a relational database which is accessible by executing software of a relational database management system (RDBMS), such as Oracle 11gR2 available from Oracle Corporation of Redwood Shores, Calif.

After act **234**, in an act **234**A, customization manager **103** checks if the customization **112** is activated by user input. Depending on the embodiment, customizations may be activated by user input, individually for a specific customization or in a group of multiple customizations. Group activation of customizations may be supported, for example, at a module level, or at a component level, depending on the embodiment. Certain embodiments support activation of customizations at a component level e.g. via user input in status field **311** shown in FIGS. **3**A and **3**C, as follows.

In one illustrative example, user input in a field **311** (FIG. **3**A) indicates that customizations of a specific component, such as "EMPLOYEE_PROFILE" are inactive, in which case branch **234**B is taken to act **236** (described below). As another example, user input in field **311** (FIG. **3**C) may indicate that customizations of a specific component, such as "EMPLOYEE_PROFILE" are active, in which case branch the customization manager goes from act **234**A to act **235** (described

below). Selective activation or inactivation based on user input as just described enables a customer to easily and quickly respond to changes in requirements by the customer's business (e.g. a previously-applied customization may no longer be needed, or vice versa). More specifically, user input indicating a customization as inactive returns operation of application software to the original version **102** (i.e. a version transmitted by vendor's computer **100**).

In act **235**, customization manager **103** prepares a customized component **1041** (which therefore results in a customized version of application software **106**) in any manner appropriate, to execute the additional software (specified by user input received in act **234**) when executing a new version of the module IJ (specified by user input received in act **232**), at the specific position (specified by user input received in act **233**). The manner in which a customized version of application software **106** (FIG. **1**B) is prepared can be different, depending on the embodiment, as follows.

In several embodiments, customization manager **103** inserts additional software **113** directly in an in-line manner at the specific position in application software **102** (thereby to obtain customized version **106**), e.g. as shown by additional software **113** which has been inserted in-line, between lines **7** and **8** of module **102**IJ as shown in FIG. **3**E. In certain other embodiments, customization manager **103** inserts a function call (not shown) at the specific position in application software **102** (thereby to obtain customized version **106**), and it is the inserted function call that in turn invokes execution of additional software **113** when executing the new version of module IJ.

In some embodiments, additional software **113** is inserted into a new version of the module IJ (e.g. between lines **7** and **8** as shown in FIG. **3**E), while in alternative embodiments additional software **113** may be inserted into a different module which may be selected based on always preceding or always following module IJ in situations wherein the specific position happens to be at the beginning or at the end of module IJ. In these alternative embodiments, insertion at the beginning of module IJ is equivalent to insertion at the very end of a preceding module IJ−1 (in situations wherein execution of module IJ always follows execution of preceding module IJ−1) and similarly insertion at the beginning of the module IJ is equivalent to insertion at the very end of a following module IJ+1 (in situations wherein execution of module IJ is always followed by execution of the following module IJ+1).

In view of the description in the preceding paragraph, it is readily apparent that customization manager **103** may prepare customized application software **106** that is to execute the additional software **113** in any manner (e.g. by insertion of the additional software **113** directly in an in-line manner into any of modules IJ−1, IJ, IJ+1, or e.g. by insertion of the additional software **113** indirectly as a function call to invoke execution of the additional software **113**), when executing application software **102** at the user-specified position (e.g. beginning position **104**IJB, in-between position at line number L or end position **104**IJE).

At this stage, computer(s) **200** may optionally display the source code of customized module **1041**) (FIG. **1**), e.g. via a browser that renders web pages on a video monitor **1112** of computer **110** for review and approval by an employee **111** of the customer, e.g. in response to user input requesting the display. In many embodiments, the source code of module **102**IJ which is received as a portion of component **102**I in generic application software **102** supplied by the software vendor, and the additional source code **113** which is received from the customer's employee **111** are both expressed in a common high-level programming language. Thus, the customer's employee **111** may review and understand customized module **1041**) after it's been customized by insertion of additional source code **113** into module **102**IJ.

When there is only one customization in database **120**, customized component **1041** includes, in addition to customized module **1041**) (FIG. **1**), one or more modules I**1**, IZ that are unchanged (when there is no applicable customization thereto). When there are multiple customizations of a component **102**I, a corresponding customized component **1041** obtained by modification thereof includes one or more customized modules and any modules that remain unchanged (again, if there is no applicable customization thereto). Also, when multiple components are customized, customized application software **106** includes all corresponding customized components obtained by modification thereof, and further includes any components that remain unchanged.

In several embodiments, computer(s) **200** include a compiler **115** that can compile source code expressed in the common high-level programming language described above. In such embodiments, compiler **115** may be transmitted by vendor's computer **100** to computer(s) **200** for use therein to compile the customized components. A common high-level programming language of compiler **115** can be, for example, the language PeopleCode which is an object-oriented language for writing software to implement business logic in one or more computers, for PeopleSoft applications. Thus, in an act **238** (FIG. **2**), customization manager **103** compiles at least one customized module **104**IJ, by using thereon compiler **115**, to obtain compiled code of a customized component **1051** in an executable application **105**, followed by storing the executable application **105** in a non-transitory computer-readable storage media, such as memory **1106** (e.g. implemented as a RAM or a ROM, depending on the embodiment).

After act **235**, customization manager **103** of some embodiments perform an optional act **236** to check if any more modules are to be customized and if so return to act **232** (described above). Moreover, after act **236**, customization manager **103** of some embodiments is programmed with an optional act **237** to check if any more components are to be customized and if so return to act **231** (described above). An executable application **105** (FIG. **1**B) created by customization manager **103** in act **238** is thereafter executed in act **239** (FIG. **2**) in the normal manner, including execution of customized component **1051** (in turn including execution of customized module IJ). Execution of executable application **105** generates output **114**A, **114**B that is different for the respective employees **111**A, **111**B of different customers A, B, depending on their corresponding additional software **113**A, **113**B which may be executed differently relative to the same generic application software **102**, depending on their respective customizations **112**A, **112**B as illustrated in FIG. **1**A.

Use of one or more field(s) in one or more GUI screen(s) to receive one or more customization(s) **112** as described above in reference to FIG. **2** is required initially, to prepare a database **120** in which the following items of information are related to one another: component name, module name, specific position in module, and identifier of additional software. The just-described items may be stored in columns of a table or a materialized view in a relational database, wherein each row identifies one customization. After the customization(s) **112** are stored in database **120**, they may be used repeatedly (with or without user-specified updates thereto), to change multiple versions of the application software.

In several embodiments, user input on customizations is received via one or more webpage(s) generated by customi-

zation manager **103** (FIG. **2**), which is/are displayed by a browser in computer **110** (FIG. **1**) on a video monitor **1112** as a screen **103**A (FIG. **3**A). Screen **103**A includes a field **301** in which employee **111** can identify a component, such as the component named EMPLOYEE_PROFILE, e.g. by typing in the name using a keyboard, or by selecting the name by using a cursor control **1113** (such as a mouse). In an example illustrated in FIG. **3**A, displayed adjacent to field **301** is a down-arrow icon **323** that can be operated by placing a cursor thereon and clicking a button on the mouse, to display a drop-down list box **301**D (FIG. **3**B). Drop-down list box **301**D displays several components of application software supplied by a software vendor to a customer that are available for customization by employee **111**.

In several embodiments, all components in a set of components of the application software are displayed in drop-down list box **301**D of screen **103**A, although in certain embodiments only components in a subset (in the set of components of the application software) that was selectively made available by the vendor are displayed by customization manager **103** in the drop-down list box **301**D. In the just-described certain embodiments, some components which are not in the displayed subset but included in the set of all components are not displayed in box **301**D (i.e. hidden from display), as being not customizable by employee **111**.

The application software may be, for example, software for an Enterprise Resource Planning (ERP) application, such as PeopleSoft and its components can be any application pages such as, Employee Profile **102**A (FIG. **5**B), Expense Reports **102**I (FIG. **5**B), Journal Entries **102**N (FIG. **5**B) etc. When a specific component is selected in field **301**, a description of the component is displayed by customization manager **103** in field **320**. At an initial stage, when there is no customization of user-selected component (e.g. component EMPLOYEE_PROFILE identified by the user input in field **301**), there are no customizations in database **120** (FIG. **2**), and hence a form **309** is displayed in screen **103**B, with blank fields **302**A, **306**A, etc to be used to receive user input on a customization. For example, form **309** includes a field **302**A to receive user input identifying a module to be customized in the user-selected component, fields **303**A, **304**A, **305**A to receive user input identifying a specific position within the component identified in field **302**A, and a field **306**A to receive user input identifying a file of additional software to be added to the component identified in field **302**A at a position identified in one of fields **303**A, **304**A or **305**A.

In form **309**, a magnifying-lens icon **302**D is displayed located adjacent to field **302**A (FIG. **3**A), operation of which (by clicking on a mouse, with cursor on the icon) displays a file system window (not shown) in which are displayed several modules of the user-selected component any one of which can be selected in the normal manner, for use in customization by employee **111**. In several embodiments, the file system window displays a path to a directory and names of files in the directory, in a manner similar to drop-down list box **301**D, as follows. Specifically, in the several embodiments, all modules in a set of modules of a user-selected component I are displayed in the file system window (not shown), although in certain embodiments only modules in a subset (in the set of modules of the user-selected component I) that has been selectively made available by the vendor of the software are displayed by customization manager **103** in the file system window (FIG. **3**B). As noted above, in the just-described certain embodiments, some modules which are not in the displayed subset but included in the set of all modules of component I are not displayed in the file system window (i.e. hidden from display), as being not customizable by employee **111**.

Although certain illustrative features have been described above in reference to FIG. **3**A, other features may be used in other embodiments of screen **103**A. For example, other embodiments may display in screen **103**A, a down-arrow icon **323** instead of a magnifying-lens icon **302**D and vice versa. Moreover, instead of displaying a drop-down list box in screen **103**A, on operation of icon **302**D other embodiments may open a file system window to receive user input identifying a path to a file in a directory of the file system, or alternatively receive a uniform resource locator (URL). Similarly, instead of displaying a file system window on operation of magnifying-lens icon **302**D, other embodiments may display a drop-down list box.

In an example illustrated in FIG. **3**C, user input in field **302**A of customization form **309**A has selected "RowInit" as the module to be customized. In addition, user input in customization form **309**A, by clicking the mouse with the cursor on field **303**A, selects "Beginning" as a specific position in the module to be customized (i.e. module RowInit). Instead of "Beginning", user input can select the specific position to be "End" by clicking on field **304**A or select the specific position to be "In Between" by clicking on field **305**A (to be followed by identifying a line number L in another field, as illustrated by field **308**B in customization form **309**B shown in FIG. **3**D).

Referring back to the example of FIG. **3**C, user input in field **306**A of customization form **309**A (in a manner similar or identical to field **302**A or field **301**) has selected a file named "StartofRowInit" as containing the additional software to be added to the to-be-customized module (i.e. module RowInit) at the specific position (i.e. Beginning) Thus, user input in the fields **302**A, **303**A, and **306**A of customization form **309**A has uniquely identified a customization **112** as the following 4-tuple: (EMPLOYEE_PROFILE, RowInit, Beginning, StartofRowInit). At this stage, employee **111** may provide user input in a field **311** (FIGS. **3**A, **3**B) to change the status of the newly-created customization **112** from "Inactive" to "Active" (FIG. **3**C), which instructs customization manager **103** to perform act **238** (described above in reference to FIG. **2**). Alternatively, as per act **236** (FIG. **2**), employee **111** may provide user input for additional customizations, in customization forms **309**B and **309**C (in a manner similar or identical to form **309**A), as illustrated in FIG. **3**D and then change the status for all these newly-created customizations from "Inactive" to "Active."

At any stage after a customization form **309**A, **309**B or **309**C is completed, computer(s) **200** may optionally display the source code of the respective customized module on a video monitor **1112** in response to user input, e.g. by clicking on a corresponding link **307**A, **307**B or **307**C in the respective form **309**A, **309**B or **309**C. FIG. **3**E illustrates one such display in response to employee **111** clicking on link **307**B (FIG. **3**D), wherein vendor-supplied software of module **102**IJ named "RowInit" has been customized at line **7** by insertion of additional source code **113** from the file named "RowInitatLine**7**" to obtain the customized module **104**U.

In a display of the type illustrated in screen **103**E (see FIG. **3**E), employee **111** may change the specific position at which the additional software is inserted, e.g. by moving the mouse to place the cursor on any line (which is different from line number L identified in field **308**B) and operating a mouse button thereon, following which the corresponding customization is automatically changed by customization manager **103**. For example, if employee **111** places the cursor on line **4** (shown in the left column of FIG. **3**E) and clicks on a mouse

button, the additional source code **113** is automatically removed from line **7** and inserted between line **3** and line **4** (as shown in FIG. **3**F), and in response to employee **111** closing this screen **103**E, the field **308**B is automatically updated from line **7** in earlier-displayed screen **103**D now updated to line **4** in screen **103**G (see FIG. **3**G). In the screen **103**F illustrated in FIG. **3**F, all newly-inserted lines of source code of additional software **113** are shown without line numbers in a column in the left side of screen **103**F, and the source code of application software in module **102**IJ are shown with line numbers in the just-described column.

In some embodiments, a generic version of application software ("existing generic application software") **102** is initially customized in an act **235** (FIG. **2**) by application of customizations received via user input as per acts **231**-**234** (FIG. **2**), to obtain an existing customized version of application software **106** (FIG. **4**A). Subsequently, a new generic version of application software **117** is received by computer(s) **200**, followed by retrieval from database **120** by customization manager **103** of one or more previously-applied customizations that are applicable to the new generic version. The retrieved customizations **119** are displayed and optionally updated as per user input **118** received from employee **111**, and when the user input includes approval they are applied by customization manager **103** to the new generic version of application software **117** resulting in a new customized version of application software **116** (FIG. **4**A), for example as described below in reference to FIG. **4**B.

Customizations **112** and additional software **113** of most embodiments are stored independent of and in addition to existing customized application software **106**, e.g. by being stored in a database **120** and/or in a file system **130**, which may be implemented on one or more non-transitory storage media such as a hard disk accessible to computer(s) **200**. Specifically, in several embodiments, additional software **113** of each customization is modularized and stored separately (e.g. in database **120** as a large object or LOB, or in file system **130** as a file), which prevents the additional software **113** from being overwritten when existing customized application software **106** is upgraded by (e.g. overwritten by) new generic application software **112**.

Hence, any customization **119** that was previously applied to customize existing generic application software **106** is available for application (on approval by user input, with or without being updated by additional user input **118**) on the new generic application software **112**, e.g. when the new generic version has modules of names identical to names of modules in the existing generic version. In several such embodiments, customization manager **103** displays on monitor **1112** any previously-applied customizations **119** that are applicable to the new generic version of application software **117**. In this manner, customization manager **103** eliminates a need for employee **111** to manually maintain a list of customizations.

Customizations which are displayed for user approval are selected in some embodiments, by matching module names in the new generic version of application software **117** to module names identified in customizations stored in the database **120**. Although module names are compared for being identical to one another in the two versions in some embodiments, to identify applicability of existing customizations to new generic application software **112**, other embodiments enable module names to differ across the two versions, e.g. by use of a map that identifies for each module in the new generic application software **112** a corresponding module in existing generic application software **106**. Hence, such a map is transmitted from vendor's computer **100** to computer(s) **200**, either internal to or external to new generic application software **112**, depending on the embodiment.

Furthermore, storage of customizations **112** in database **120** enables each of customers A and B to independently isolate and track custom changes required only by that customer I (wherein I=A or I=B), which helps in applying maintenance patches provided by software vendors, and enables each customer I to reapply their custom changes with less efforts and time. Moreover, when a customer I upgrades to the new generic version of application software **102**, their own customizations are easily re-applied with minimal time and effort. Thus, use of customization manager **103** results in substantial savings in terms of time and effort and minimize the total cost of ownership of application software.

Thus, after one or more customization(s) **112** (FIG. **1**B) are created and stored in database **120** as described above in reference to act **234** in FIG. **2**, the stored customization(s) are initially applied as per act **235** (FIG. **2**) to existing generic application software **102** (FIG. **4**A) and subsequently these previously-applied customizations are re-applied to new generic application software **117** (FIG. **4**A) when computer(s) **200** are programmed with a method **400**, which includes acts **401**-**408** (FIG. **4**B). In method **400**, a new version of application software **117** is transmitted from vendor's computer **100** and received by computer(s) **200** in an act **401** (FIG. **4**B). After receipt of the new version of application software **117**, in an act **402**, customer's computer(s) **200** use database **120**, to identify for each component received in act **401**, any customizations thereof present in database **120**, based on the component names being identical (e.g. by comparing each component's name in the new version of application software **117** with each component's name in the existing version of application software **102**).

For application software in which modules are grouped into components, computer(s) **200** loops over each component I received in act **401**, and within the loop for each component I computer(s) **200** further loops over each module IJ received in act **401**, and executes an SQL query on database **120** to identify module names that are identical to retrieve their corresponding customizations (i.e. identify those n-tuples in database **120** in which the name of component I is one of the elements, and the name of module IJ is another of the elements that respectively match a component name and a module name in the new version of application software **117**). In an example described above, computer(s) **200** identify in act **402** three customizations (see forms **309**A, **309**B and **309**C in FIG. **3**D) for component EMPLOYEE_PROFILE, and module RowInit. In some embodiments, on completion of the looping described in this paragraph, computer(s) **200** identify all customizations in database **120** that identically name a module in new version of application software **117**. Only previously-applied customizations **119** in database **120** which are applicable to new generic application software **117** are identified in act **402** (i.e. customizations of any modules of existing generic application software **102** in database **120** which are not named identically as modules of new generic application software **117**, are thus not identified in act **402**).

Also, at this stage, an element in each customization identified on completion of act **402**, identifies a specific position within existing generic application software **102** (although at this stage, not within new version of application software **117** in which the identically named module may or may not have changed e.g. by addition of new lines and/or by deletion of existing lines of code). Hence, in an act **403**, the previously-applied customizations retrieved from database **120** by act **402** are displayed by customization manager **103** to employee

111. In several embodiments of act 403, computer(s) 200 prepare screens to display to employee 111 (e.g. via a browser in computer 110), for each previously-applied customization 119, at least a name of a module and a specific position (e.g. beginning, end, or at a line number) at which additional software was previously inserted (to prepare an existing version of customized module).

A specific format in which one or more previously-applied customizations 119 (FIG. 4A) are displayed on video monitor 1112 can be different, depending on the embodiment. A subset of previously-applied customizations 119 (FIG. 4A) which are to be applied at a boundary of a module (e.g. at the beginning of a module before the first line therein or at the end of the module after the last line therein) are unlikely to be updated by customer's employee 111 regardless of whether or not the corresponding module has been changed by employee 101 of the software vendor, and hence in some embodiments this subset is displayed by customization manager 103 in a table of the type shown in screen 411 (FIG. 4C). Customizations 119 which are not at module boundaries, i.e. applicable at a line number L between the beginning and the end of a module, are more likely to be updated by employee 111 if the module has been changed by the vendor, and hence in such embodiments each customization in this subset is displayed by customization manager 103 in its own panel in another screen 412 (FIG. 4D) which displays a list of panels. Instead of the just-described two-screen display, certain embodiments may display all previously-applied customizations 119 (FIG. 4A) in a single screen, similar or identical to the above-described screen 103D (FIG. 3D).

When one or more customizations 119 (FIG. 4A) are displayed (as per act 403), employee 111 can change a customization, e.g. by changing a previously-specified position which may be at a beginning of a module (e.g. see field 303A in screen 309A) to a newly-specified position which may be in between the beginning and the end of the module (e.g. at line number 7, as shown in field 305B in FIG. 3D) or vice versa. In response to any change in a customization 119 indicated by user input 118, computer(s) 200 update that customization 119 in database 120 correspondingly. For example, a change in a specific position at which additional software is to be executed may be necessitated, for example, if a new version of the module (e.g. module RowInit in FIG. 3D) contains new instructions at the beginning, in which case employee 111 may specify that the additional software 113 is to be executed after these new instructions (e.g. change from beginning to in-between at a user-specified line number). As per branch 404B (FIG. 4B), employee 111 may make any number of changes to displayed customizations, and each change made by user input 118 is in turn used by computer(s) 200 to update the corresponding customization in database 120 and the updated customization is used to customize the new generic application software 117.

As noted above, customizations that were previously applied at a boundary of a module are unlikely to be changed and to facilitate speedy approval in such situations, screen 411 (FIG. 4C) includes a table with one row for each customization at module boundary, in the following four columns: Component column 411A, Module column 411C, Beginning column 411D, and End column 411E. Component column 411A displays names of components in the application software to which at least one customization in database 120 is found to be applicable. Module column 411C displays names of modules in the application software to which at least one customization in database 120 is found to be applicable. Beginning column 411D indicates by presence of a check mark therein that additional software identified by the customization is to be inserted at the beginning of the module identified in the module column 411C. End column 411E indicates by presence of a check mark therein that additional software identified by the customization is to be inserted at the end of the module identified in the module column 411C.

In each row of the table in screen 411, a check mark is present in only one of the Beginning column 411D or End column 411E, not both (in situations wherein the additional software is to be executed at the identified module's boundary). In addition to the above-described four columns, the table in screen 411 of some embodiments may include an additional column, namely Preview Code column 411F, with a hyperlink in each row clicking on which opens a screen of the type illustrated in FIGS. 3E and 3F. In some embodiments, application software 102 is event oriented and in such embodiments, screen 411 includes an additional column in the table, namely Event column 411B, in which the names of events are displayed, whereby a module in a row is invoked by the application software (e.g. written in PeopleCode) on occurrence of a corresponding event identified in that row.

As shown in FIG. 4C, screen 411 displays a button 411R labeled "Re-Apply", operation of which causes customization manager 103 to take branch 404A (FIG. 4B), from act 403 to act 405 in which all module boundary customizations shown in screen 411 are applied to the new version of application software 117. Note that operation of button 411R labeled "Re-Apply" provides user input as an indication to computer(s) 300 that the specific position is unchanged in the previously-applied customization(s) which are currently displayed in screen 411. Hence, least for the modules identified in the previously-applied customization(s) displayed in screen 411, the corresponding additional software has been approved by the user, for execution at the same respective specific position(s) in new version of application software 117 (FIG. 4A) as in the existing version of application software 102.

In some embodiments, just before performing act 405 (FIG. 4B), the above-described act 234A is performed, to check if the customization(s) is/are indicated as activated (e.g. via user input in status field 311, shown in FIGS. 3A and 3C). Then, in act 405, in a manner similar to that noted above for act 235, the previously-applied customizations shown in screen 411 are now re-applied, e.g. directly by insertion of the additional software 113 identified by each previously-applied customization 119 (FIG. 4A), into corresponding modules of the new generic application software 117 (or indirectly by insertion of a function call to invoke execution of additional software 113, as noted above).

After the (direct or indirect) insertion in act 405, in several embodiments, customization manager 103 goes to act 403 to display in screen 412 (FIG. 4D), one or more previously-applied customization(s) that were identified in act 402 and are still to be applied. For example, in act 403, one or more previously-applied customizations 119 (FIG. 4A) which are to be applied at a specific line number within each module are displayed, as illustrated in screen 412 (FIG. 4D). Screen 412 of some embodiments includes multiple panels, one panel for each customization 119, wherein a first panel 413 displays the following fields: Component 413A, Event 413B, Module 413C, Line Number 413D, and Preview Code 413E. As noted above, Preview Code 413E has a hyperlink which opens a screen of the type illustrated in FIGS. 3E and 3F.

Line Number 413D is a field that is editable by user input. Thus, depending on whether or not application software has changed in Module 413C, employee 111 may or may not change field 413D, and then operate the re-apply button 413F. User input to update field 413D may be provided directly by

employee **111** typing a number on a keyboard, or provided indirectly by employee **111** clicking on a mouse button in a preview screen **103**E illustrated in FIG. **3**E which automatically moves the previously-applied software to a new line in screen **103**F illustrated in FIG. **3**F, as described above. Independent of a specific mechanism by which the user input is provided to update field **413**D, such an update is an indication of a change in the specific position at which the new version of application software **117** (FIG. **4**A) is to execute the corresponding additional software **113**. Hence, a specific position in the existing version of application software **102** is changed to a new specific position in the new version of application software **117**, based on the just-described indication. More specifically, operation of button **413**F results in the specific position that was previously stored in database **120** being overwritten by a new specific position identified by user input in field **413**D. Moreover, this new specific position is thereafter used in application of the customization, specifically by inserting the additional software into the new generic application software **117**, at the new specific position.

Note that panel **413** displays a re-apply button **413**F which is individually operable to re-apply a customization as displayed in panel **413** independent of any other customization. To cover situations in which there are no changes needed for all previously-applied customizations **119**, screen **412** includes a button **414** operable to re-apply all customizations displayed in screen **412**. Operation of button **414** eliminates the need for employee **111** to operate individual re-apply buttons **413**F in each individual panel in screen **412** for each customization. Screen **412** also includes a cancel button **415** operable to cancel all customizations displayed in screen **412**.

After insertion in act **405**, customization manager **103** goes via branch **406**A (FIG. **4**B) to act **407** to compile the customized modules (in a manner similar or identical to act **238** described above in reference to FIG. **2**). In some embodiments, the compilation in act **407** is performed in response to the status (in field **311** in FIG. **3**A) being changed from "Inactive" to "Active" (as shown field **311** in FIG. **3**C). In some embodiments, the compilation in act **407** is performed on a version of the application software that is applicable to a market which is specified in field **312** (FIG. **3**C). For example, when the market is specified in field **312** to be global, then the customizations all applied to versions of the application software, regardless of locale. But if a market specified in field **312** is, for example, "North America" then compilation in act **407** is performed on only one version of the application software (which is pre-configured, to be executed by employees **111** who are known to be physically located in the continent of North America). After act **407**, the executable generated by act **407** is executed in act **238** in the normal manner, thereby to execute the new version of the application software **116** customized by the customizations **119**.

The act(s) illustrated in FIGS. **2** and **4**B may be used to program one or more computer(s) **200** each of which may be implemented as illustrated in FIG. **5**A and discussed below. Thus, depending on the embodiment, computer(s) **110** used by a customer's employee(s), and/or computer(s) **200** used in a cloud may be programmed to perform one or more or all of acts **231-239**, and **401-408** in whole or in part, and in any combination with one or more hardware components described in reference to computer(s) **200** below.

In some embodiments, computer(s) **200** includes a bus **1102** (FIG. **5**A) or other communication mechanism for communicating information, and one or more processor(s) **1105** coupled with bus **1102** for processing information. Computer(s) **200** uses (as the above-described memory) a main memory **1106**, such as a random access memory (RAM) or other dynamic storage device, coupled to bus **1102** for storing information and instructions (e.g. to perform act(s) of FIGS. **2**A and **3**A) to be executed by processor(s) **1105**.

Main memory **1106** (FIG. **5**A) also may be used for storing temporary variables or other intermediate information during execution of instructions (e.g. in modules **461-466**) by processor **1105**. Computer(s) **200** further includes a read only memory (ROM) **1104** or other static storage device coupled to bus **1102** for storing static information and instructions for processor **1105**, such as software in the form of a browser. A storage device **1110**, such as a magnetic disk or optical disk, is provided and coupled to bus **1102** for storing information and instructions.

Computer(s) **200** (FIG. **5**A) may be coupled via bus **1102** to a display device or video monitor **1112** such as a cathode ray tube (CRT) or a liquid crystal display (LCD), for displaying information (e.g. via a browser) to a computer user (e.g. user **111**) on the display **1112**. An input device **1114**, including alphanumeric and other keys (e.g. of a keyboard), is coupled to bus **1102** for communicating information (such as user input, e.g. from any user **111**) to processor **1105**. Another type of user input device is cursor control **1113**, such as a mouse (described above), a trackball, or cursor direction keys for communicating information and command selections to processor **1105** and for controlling cursor movement on display **1112**. This input device typically has two degrees of freedom in two axes, a first axis (e.g., x) and a second axis (e.g., y), that allows the device to specify positions in a plane. In addition to display device **1112** on which output **114**A, **114**B (FIG. **1**A) may be displayed, computer(s) **200** may include a speaker (not shown) as another output device for use by processor **1105** in interacting with any user(s) **111** (such as respective employees **111**A, **111**B).

As described elsewhere herein, execution of customization manager **103** (FIG. **4**B) in computer(s) **200** (FIG. **5**A) may be implemented by one or more processor(s) **1105** executing one or more sequences of one or more instructions that are contained in main memory **1106**. Such instructions may be read into main memory **1106** from another non-transitory computer-readable storage medium, such as storage device **1110**. Execution of the sequences of instructions contained in main memory **1106** causes processor **1105** to create, store and update customizations, and to create customized component **1041** and customized application software **106** as illustrated in FIGS. **2** and **4**B and/or to display screens as illustrated in FIGS. **3**A-**3**G. In alternative embodiments, hard-wired circuitry may be used in place of or in combination with software instructions to perform act(s) illustrated in FIGS. **2** and **4**B.

The term "non-transitory computer-readable storage media" as used herein refers to any non-transitory storage media that participate in providing instructions to processor **1105** for execution. One or more such non-transitory storage media may take many forms, including but not limited to (1) non-volatile storage media, and (2) volatile storage media. Common forms of non-volatile storage media include, for example, a floppy disk, a flexible disk, hard disk, optical disk, magnetic disk, magnetic tape, or any other magnetic medium, a CD-ROM, any other optical medium, punch cards, paper tape, any other physical medium with patterns of holes, a PROM, and EPROM, a FLASH-EPROM, any other memory chip or cartridge that can be used as storage device **1110**, to store program code in the form of instructions and/or data structures and that can be accessed by computer(s) **200**. Volatile storage media includes dynamic memory, such as main memory **1106** which may be implemented in the form of a random access memory or RAM.

Instructions to processor **1105** can be provided by a transmission link or by a non-transitory storage medium from which a computer can read information, such as data and/or code. Specifically, various forms of transmission link and/or non-transitory storage medium may be involved in providing one or more sequences of one or more instructions to processor **1105** for execution. For example, the instructions may initially be comprised in a non-transitory storage device, such as a magnetic disk, of a remote computer. The remote computer can load the instructions into its dynamic memory (RAM) and send the instructions over a telephone line using a modem.

A modem local to computer(s) **200** (FIG. **5**A) can receive information about a change to a collaboration object on the telephone line and use an infra-red transmitter to transmit the information in an infra-red signal. An infra-red detector can receive the information carried in the infra-red signal and appropriate circuitry can place the information on bus **1102**. Bus **1102** carries the information to main memory **1106**, from which processor **1105** retrieves and executes the instructions. The instructions received by main memory **1106** may optionally be stored on storage device **1110** either before or after execution by processor **1105**.

Computer(s) **200** (FIG. **5**A) also includes a communication interface **1115** coupled to bus **1102**. Communication interface **1115** provides a two-way data communication coupling to a network link **1120** that is connected to a local network **1122**. Local network **1122** may interconnect multiple computers (as described above). For example, communication interface **1115** may be an integrated services digital network (ISDN) card or a modem to provide a data communication connection to a corresponding type of telephone line. As another example, communication interface **1115** may be a local area network (LAN) card to provide a data communication connection to a compatible LAN. Wireless links may also be implemented. In any such implementation, communication interface **1115** sends and receives electrical, electromagnetic or optical signals that carry digital data streams representing various types of information.

Network link **1120** (FIG. **5**A) typically provides data communication through one or more networks to other data devices. For example, network link **1120** may provide a connection through local network **1122** to a host computer **1125** or to data equipment operated by an Internet Service Provider (ISP) **1126**. ISP **1126** in turn provides data communication services through the world wide packet data communication network **1124** now commonly referred to as the "Internet". Local network **1122** and network **1124** both use electrical, electromagnetic or optical signals that carry digital data streams. The signals through the various networks and the signals on network link **1120** and through communication interface **1115**, which carry the digital data to and from computer(s) **200**, are exemplary forms of carrier waves transporting the information.

Computer(s) **200** (FIG. **5**A) can send messages and receive data, including program code, through the network(s), network link **1120** and communication interface **1115**. In the Internet example, a server **1100** might transmit information retrieved from RDBMS database through Internet **1124**, ISP **1126**, local network **1122** and communication interface **1115**. The instructions for performing the operations of FIG. **2** or **4**B may be executed by processor **1105** as they are received, and/or stored in storage device **1110**, or other non-volatile storage for later execution. In this manner, computer(s) **200** may additionally or alternatively obtain instructions and any related data.

FIG. **5**A is a very low-level representation of many hardware components of one or more of computer(s) **200** described above in reference to FIGS. **1**, **2**, **3**A-**3**G, and **4**A-**4**D. Several embodiments have one or more additional software components in main memory **1106** as shown in FIG. **5**B. In addition to main memory **1106**, computer(s) **200** may include one or more other types of memory such as flash memory (or SD card) and/or a hard disk and/or an optical disk (also called "secondary memory") to store data and/or software for loading into memory **1106** (also called "main memory") and/or for use by processor(s) **1105**. In some embodiments, computer(s) **200** of FIG. **5**A implements a relational database management system **1130** (FIG. **5**B) to manage data in one or more tables of a relational database **120** of the type illustrated in FIG. **5**B. Such a relational database management system may manage a distributed database system that includes multiple databases, each table being stored on different storage mechanisms.

In some embodiments, the multiple databases are made to appear as a single database. In such embodiments, processor **1105** can access and modify the data in a relational database **120** via RDBMS **1130** (FIG. **5**B) that accepts queries from various modules I1-IZ (FIG. **4**A) in conformance with a relational database language, the most common of which is the Structured Query Language (SQL). The commands are used by processor **1105** of some embodiments to store, modify and retrieve customizations **112**A, **112**B (FIG. **1**A) in the form of rows in tables in relational database **120** and additional software **113**A, **113**B (FIG. **1**A) in the form of LOBs.

Relational database management system **1130** (FIG. **5**B) further includes output logic that makes the data in a database table of relational database **120** available to a user via a graphical user interface that generates a screen on a video monitor display **1112**, such as the screens illustrated in FIGS. **3**A-**3**G and **4**C-**4**D. In one example, the output logic of computer(s) **200** provides output **114**A, **114**B (FIG. **1**A) via a web-based user interface that depicts in a browser of another computer **100**, information related to customizations, etc as illustrated in any one or more of FIGS. **3**A-**3**G, and **4**C-**4**D. Additionally and/or alternatively, screens responsive to user input via a keyboard as a command in a command-line interface of computer **100** and/or user input via a mouse and a cursor displayed on a video monitor of computer **100** may be generated by computer(s) **200**.

In some embodiments of computer(s) **200**, functionality in the above-described operations or acts of FIGS. **2** and **4**B is implemented by processor **1105** (FIG. **5**A) executing software in memory **1106** of computer(s) **200**, although in other embodiments such functionality is implemented in any combination of hardware circuitry and/or firmware and/or software in computer(s) **200**. Depending on the embodiment, various functions of the type described herein may be implemented in software (executed by one or more processors or processor cores) or in dedicated hardware circuitry or in firmware, or in any combination thereof. Accordingly, depending on the embodiment, any one or more of the means for performing operations or acts of FIGS. **2** and **4**B can, but need not necessarily include, one or more microprocessors, embedded processors, controllers, application specific integrated circuits (ASICs), digital signal processors (DSPs), multi-core processors and the like, appropriately programmed with software in the form of instructions to implement one or more steps of the type described herein.

Any non-transitory computer-readable medium tangibly embodying software (also called "computer instructions") may be used in implementing one or more acts or operations described herein and illustrated in FIGS. **2** and **4**B. Such

software may include program codes stored in memory **1106** and executed by processor **1105** (FIG. **5**A). Memory **1106** may be implemented within or external to processor **1105**, depending on the embodiment. When implemented in firmware and/or software, logic to perform one or more acts or operations of FIGS. **2** and **4**B may be stored as one or more computer instructions or code on a non-transitory computer-readable medium.

In some embodiments, one or more of computer(s) **200** may include multiple processors, each of which is programmed with software in a memory **1106** shared with each other to perform acts of the type described above to implement the individual modules I1-IZ illustrated in FIG. **4**A. For example, a first processor **1105** in computer(s) **200** may be programmed with software in memory **1106** to implement a receiving circuit that receives a new version of application software from a software vendor's computer **100**. A second processor **1105** in computer(s) **200** may be programmed with software in memory **1106** (FIG. **5**A) to implement a displaying circuit that displays a name of a module in the application software and another displaying circuit that displays an indication of a specific position in the module at which additional software was inserted to prepare a current version of a customized module. A third processor **1105** in computer(s) **200** may be programmed with software in memory **1106** to implement a customization circuit that prepares and store a customized version of the application software that is to execute the additional software when executing a new version of the module at the specific position identified by the indication. A fourth processor **1105** in computer(s) **200** may be programmed with software in memory **1106** to implement an execution circuit that executes at least a new executable that is based on the new version of the customized module. The just-described four processors **1105** are programmed to interoperate with one another to form a customization manager **103**, which depending on the embodiment is implemented internal to application software **102** (as illustrated in FIG. **5**B) or external to application software **102** (as illustrated in FIG. **5**C), or partly internal and partly external as will be apparent to a skilled artisan.

Although four processors **1105** (FIG. **5**A) have been just described for some embodiments to implement the respective means, in other embodiments a single processor **1105** may be used in a time shared manner to implement the just-described means of the previous paragraph. Furthermore, in still other embodiments, one processor **1105** may be used in a time-shared manner to implement one or more parts of various modules. Moreover, one or more processors **1105** may be programmed to implement one or more components of application software **102**, such as Employee Profile **102**A (FIG. **5**B), Expense Reports **102**I (FIG. **5**B), Journal Entries **102**N (FIG. **5**B), in addition to customization manager **103**. Furthermore, although processors **1105** have been described above for certain embodiments as being included in a single computer(s) **200**, in other embodiments multiple such processors **1105** may be included in multiple computers **200**, for example four computers **200** may implement the operations described above in reference to FIGS. **1**, **2**, **3**A-**3**G, and **4**A-**4**D. Additionally, in one or more such embodiments, one or more processor(s) **1105** with a bus **1103** execute ERP software **102** (FIG. **5**B) in computer(s) **200**.

Various adaptations and modifications may be made without departing from the scope of the described embodiments. Numerous modifications and adaptations of the embodiments described herein are encompassed by the attached claims.

The invention claimed is:

1. A method implemented by at least one computer, the method comprising:

receiving, via a field of a first screen of a graphical user interface, a first specific position within a first existing module, at which additional software is to be executed, during execution of an existing generic version of application software that comprises a plurality of modules including the first existing module;

wherein the first specific position is selected, by user input in the first screen, to be at a beginning of the first existing module, or at an end of the first existing module, or at a specific line number in between the beginning and the end of the first existing module;

receiving the additional software;

storing in a database, a customization that comprises a first name of the first existing module, and the first specific position within the first existing module;

receiving a new generic version of the application software;

automatically identifying, in the new generic version of application software, by use of at least one processor and the customization in the database, a first new module having a first name identical to the first name of the first existing module in the existing generic version of the application software, the first existing module being associated with the additional software to be executed when executing an existing customized version of the application software;

receiving via a second screen of the graphical user interface, a new specific position at which the additional software is to be executed in the first new module when executing a new customized version of the application software;

automatically preparing and storing in one or more non-transitory computer-readable storage media, the new customized version of the application software to execute the additional software when executing the first new module in the new generic version of the application software;

wherein the new customized version of the application software is obtained, based on the new specific position, by automatic insertion of the additional software, directly or via a function call, into the new generic version of the application software; and

executing a new executable based on the new customized version of the application software.

2. The method of claim **1** further comprising:

after receipt of the new generic version and before the executing, receiving an indication via a re-apply button in the second screen that the new specific position is unchanged.

3. The method of claim **1** wherein during the executing, the additional software is executed at the new specific position in the first new module.

4. The method of claim **1** wherein:

L is the specific line number in the first existing module such that

$$1<L<T$$

with T being a total number of lines of source code in the first existing module; and

the method further comprises receiving an indication of the specific line number L.

5. The method of claim **1** wherein:

the first existing module comprises a plurality of first instructions in source code form;

the additional software comprises a plurality of second instructions in source code form;

a first customized module in the existing customized version of the application software comprises the plurality of first instructions and the plurality of second instructions;

the method further comprises:

preparing a third screen to display the first customized module; and

displaying the third screen, wherein the plurality of first instructions are displayed with line numbers and the plurality of second instructions are displayed without line numbers.

6. The method of claim **1** wherein:

the first existing module comprises a plurality of first instructions in source code form;

the additional software comprises a plurality of second instructions in source code form; and

the plurality of first instructions and the plurality of second instructions are expressed in a common high level language.

7. The method of claim **2** wherein:

the second screen displays multiple customizations including said customization;

the specific position in each of the multiple customizations is at a module boundary;

the module boundary is at the beginning or the end of a module; and

the re-apply button is common to all the multiple customizations on the second screen.

8. The method of claim **2** wherein:

the second screen displays multiple customizations including said customization;

said customization identifies the specific line number and the re-apply button is specific to said customization; and

the second screen displays another re-apply button applicable to another customization among the multiple customizations.

9. One or more non-transitory computer-readable storage media comprising a plurality of instructions that when executed cause one or more processors to perform a method, the plurality of instructions comprising:

instructions to receive, via a field of a first screen of a graphical user interface, a first specific position within a first existing module, at which additional software is to be executed, during execution of an existing generic version of application software that comprises a plurality of modules including the first existing module;

wherein the first specific position is selected, by user input in the first screen, to be at a beginning of the first existing module, or at an end of the first existing module, or at a specific line number in between the beginning and the end of the first existing module;

instructions to receive the additional software;

instructions to store in a database, a customization that comprises a first name of the first existing module, and the first specific position within the first existing module;

instructions to receive a new generic version of the application software;

instructions to receive automatically identify, in the new generic version of application software, by use of at least one processor and the customization in the database, a first new module having a first name identical to the first name of the first existing module in the existing generic version of the application software, the first existing module being associated with the additional software to be executed when executing an existing customized version of the application software;

instructions to receive via a second screen of the graphical user interface, a new specific position at which the additional software is to be executed in the first new module when executing a new customized version of the application software;

instructions to automatically prepare and store in one or more non-transitory computer-readable storage media, the new customized version of the application software to execute the additional software when executing the first new module in the new generic version of the application software;

wherein the new customized version of the application software is obtained, based on the new specific position, by automatic insertion of the additional software, directly or via a function call, into the new generic version of the application software; and

instructions to execute a new executable based on the new customized version of the application software.

10. The one or more non-transitory computer-readable storage media of claim **9** wherein:

an indication is received that the new specific position is unchanged; and

during execution of the new executable, the additional software is executed at the new specific position in the first new module.

11. The one or more non-transitory computer-readable storage media of claim **9** wherein the plurality of instructions to be executed to perform the method further comprise:

instructions to compile at least the existing customized version of the application software to obtain an existing executable and instructions to execute at least the existing executable, prior to receipt of the new generic version of application software.

12. The one or more non-transitory computer-readable storage media of claim **9** wherein:

L is the specific line number in the first existing module such that

$$1<L<T$$

with T being a total number of lines of source code in the first existing module; and

the method further comprises receiving an indication of the specific line number L.

13. The one or more non-transitory computer-readable storage media of claim **9** wherein:

the first existing module comprises a plurality of first instructions in source code form;

the additional software comprises a plurality of second instructions in source code form;

a first customized module in the existing customized version of the application software comprises the plurality of first instructions and the plurality of second instructions;

the plurality of instructions to be executed to perform the method comprise instructions to prepare a third screen to display the first customized module; and

the plurality of instructions to be executed to perform the method comprise instructions to display in the third screen, the plurality of first instructions with line numbers and the plurality of second instructions without line numbers.

14. The one or more non-transitory computer-readable storage media of claim **9** wherein:

the new customized version of the application software is prepared by automatically inserting the additional software into the first existing module in the application software.

15. The one or more non-transitory computer-readable storage media of claim **9** further comprising:

instructions to receive an indication via a re-apply button in the second screen that the new specific position is unchanged.

16. The one or more non-transitory computer-readable storage media of claim **15** wherein:

the second screen displays multiple customizations including said customization;

the specific position in each of the multiple customizations is at a module boundary;

the module boundary is at the beginning or the end of a module; and

the re-apply button is common to all the multiple customizations on the second screen.

17. The one or more non-transitory computer-readable storage media of claim **15** wherein:

the second screen displays multiple customizations including said customization;

said customization identifies the specific line number and the re-apply button is specific to said customization; and

the second screen displays another re-apply button applicable to another customization among the multiple customizations.

18. An apparatus comprising one or more processors coupled to one or more non-transitory computer-readable storage media, wherein the one or more non-transitory computer-readable storage media comprise a plurality of instructions that when executed cause the one or more processors to perform a method, wherein:

the one or more processors are configured by the plurality of instructions, to receive via a field of a first screen of a graphical user interface, a first specific position within a first existing module, at which additional software is to be executed, during execution of an existing generic version of application software that comprises a plurality of modules including the first existing module;

wherein the first specific position is selected, by user input in the first screen, to be at a beginning of the first existing module, or at an end of the first existing module, or at a specific line number in between the beginning and the end of the first existing module;

the one or more processors are configured by the plurality of instructions, to receive the additional software;

the one or more processors are configured by the plurality of instructions, to store in a database, a customization that comprises a first name of the first existing module, and the first specific position within the first existing module;

the one or more processors are configured by the plurality of instructions, to receive a new generic version of the application software;

the one or more processors are configured by the plurality of instructions, to automatically identify, in the new generic version of application software, by use of at least one processor and the customization in the database, a first new module having a first name identical to the first name of the first existing module in the existing generic version of the application software, the first existing module being associated with the additional software to be executed when executing an existing customized version of the application software;

the one or more processors are configured by the plurality of instructions, to receive via a second screen of the graphical user interface, a new specific position at which the additional software is to be executed in the first new module when executing a new customized version of the application software;

the one or more processors are configured by the plurality of instructions, to automatically prepare and store in one or more non-transitory computer-readable storage media, the new customized version of the application software to execute the additional software when executing the first new module in the new generic version of the application software:

wherein the new customized version of the application software is obtained, based on the new specific position, by automatic insertion of the additional software, directly or via a function call, into the new generic version of the application software; and

the one or more processors are configured by the plurality of instructions, to execute a new executable based on the new customized version of the application software.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO.	: 9,274,790 B2
APPLICATION NO.	: 14/266460
DATED	: March 1, 2016
INVENTOR(S)	: Marimuthu et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In drawings,

On sheet 1 of 15, in FIG. 1A, line 29, Delete "1'4B" and insert -- 114B --, therefor.

On sheet 2 of 15, in FIG. 1B, under Reference Numeral 112, delete "Customizat on" and insert -- Customization --, therefor.

In specification,

In column 7, line 58, delete "1041)" and insert -- 104IJ --, therefor.

In column 8, line 2, delete "1041)" and insert -- 104IJ --, therefor.

In column 10, line 33, after "(i.e. Beginning)" insert -- . --.

Signed and Sealed this
Twentieth Day of September, 2016

Michelle K. Lee

Michelle K. Lee
Director of the United States Patent and Trademark Office